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A pair of Russian Aerospace Forces MiG-31Ks – '89 Red' and '99 Red' – each armed with a Kinzhal missile. Piotr Butowski



New threats for the 2020s

The cover story for the first issue of *AFM* of the new decade brings into focus the growing strategic importance of the Arctic – and how military expansion 'on the top of the world' means it's rapidly becoming a key region in the current 'New Cold War' between Russia and the West. Ten years ago, with many NATO Western air arms mired in insurgency-style conflicts in the Middle East and Afghanistan, the idea of the Arctic as a future battlefield may have seemed somewhat remote. Now, the retreating polar ice cap is an example of how quickly a military's list of priorities can be changed, with a resultant requirement to prepare for new kinds of warfare in unexpected parts of the world.

And, as Air Marshal (ret'd) Greg Bagwell CB CBE points out in his column this month, alongside the 'High North', space is becoming an increasingly critical domain for militaries. The RAF has already made efforts to start addressing development of its space-based

capabilities. As *AFM*'s columnist observes, in the UK at least, "military ownership of space is most definitely under the leadership and guidance of the air force".

As this magazine was going to press, Russia's TASS news agency provided an example of another emerging threat – that posed by hypersonic weapons, defeat of which may well be reliant on space-based surveillance assets. It was revealed that, in mid-November, a pair of Russian MiG-31Ks took off from Olenya air base north of the Arctic Circle. One of the jets launched a Kinzhal air-launched ballistic missile against a ground target 800 miles (1,300km) away at the Pemboy training range.

The nuclear-capable Kinzhal strike system was revealed by President Vladimir Putin in his annual state-of-the-nation speech on March 1, 2018. It was one of several previously unannounced and innovative strategic weapons systems that were identified. Others included a nuclear-

powered cruise missile and a nuclear-capable underwater drone. Significantly, this latest test brought together a hypersonic strategic weapon deployed in the Arctic theatre.

In a report last May, the Royal United Services Institute noted how, as well as missile-armed manned bombers, Russia can now call upon sea-launched Kalibr and ground-launched SSC-8 cruise missiles plus ballistic threats such as the Kinzhal and the RS-26 intercontinental ballistic missile to deliver precision strikes against the UK and other Western European targets from intermediate ranges. The 'New Cold War' looks like it will provide no shortage of challenges.



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The open day at Tainan Air Base on October 19 was the only event of its kind to take place in Taiwan for 2019, after bad weather forced the cancellation of the open house planned for Hsinchu AB in August. *AFM* contributor Dietmar Fenners reports from Tainan.

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The 139th Airlift Squadron – part of the New York Air National Guard's 109th Airlift Wing – is probably the only flying unit that operates at opposite ends of the world. The

wing supports research activities in both polar regions, two of the most inhospitable areas on the planet. Rogier Westerhuis travelled to Greenland to learn more about this unit's unique challenges and mission.

74 Swedish tanker times

Some 20,000ft above northern Sweden, Björn Rüdén joined the Swedish Air Force's dedicated tanker, callsign 'Mighty 842', as Gripen pilots learn the art of aerial refuelling.

80 'New Cold War' at the top of the world

Across the frozen Arctic north, Russia and the West are squaring up in a new confrontation as they seek to control the region's natural resources and vital sea routes. Tim Ripley looks at how rival air forces are at the centre of events in this strategically important area.

90 Wings over paradise

In French Polynesia, half a dozen military aircraft share a wide range of missions on a territory the size of Europe. As Frédéric Lert explains, there's a permanent battle against the 'tyranny of distance'.



Cover: A spectacular air-to-air study of a Russian Aerospace Forces' Tu-160 strategic missile carrier, one of the three Long-Range Aviation bomber types that now visit the Arctic airfields of Tiksi, Pevek and Vorkuta for periodic exercises. Occasionally, the bombers will carry out live firings of Kh-55/555 or Kh-101 long-range cruise missiles at firing ranges along the northern Russian coast to demonstrate their strategic capabilities. Turn to p80 to find out more about why the Arctic is rising up the agenda of military planners in Moscow and NATO. Evgeniy Kazennov **Above:** An impressive gathering of fourth- and fifth-generation air power assembled for the latest iteration of the Blue Flag air combat exercise, which took place at Ovda Air Base in southern Israel. From left to right: Italian Air Force F-2000A Typhoon, US Air Force F-16CM Block 50, Israeli Air Force F-15A Baz, Israeli Air Force F-35I Adir, Italian Air Force F-35A, Hellenic Air Force F-16C Block 52M and Luftwaffe Eurofighter EF2000. Although only established in 2013, the Israeli Air Force's biennial Blue Flag is recognised as one of the most important international events of its kind – the only 'missing' participant from this formation is the Royal Jordanian Air Force, whose presence in the manoeuvres is not publicised. IAF

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94 EXERCISE REPORT: Blue Flag 2019

Riccardo Niccoli reports from Ovda, where the latest Blue Flag exercise involved around 1,000 personnel and 70 aircraft – including, for the first time, F-35s from both Israel and Italy.

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First series-production Gripen E for Sweden



Gripen E 39-6002 wears a new three-colour grey splinter camouflage scheme. Saab

SAAB FLEW the first series-production Gripen E aircraft for Sweden on November 30. Test pilot Henrik Wänseth from the Swedish Defence Materiel Administration (Försvarets materielverk, FMV) was at the controls for the 76-minute sortie. The company confirmed that the fighter, serial 39-6002, wearing the code '6002', is entering the joint Swedish test

programme and will carry out acceptance and operational development flights. The jet features a cockpit equipped with the company's Wide Area Display (WAD).

Saab has also completed three Gripen E prototypes. Aircraft 39-8 (first flown on June 15, 2017) is mainly being used for airframe and general flight control tests, while 39-9 (November 26, 2018) is

a tactical systems testbed, and 39-10 (June 10, 2019) has been completed as a production-standard airframe.

Sweden is due to receive the first of 60 Gripen Es before the end of 2019 and deliveries will continue until 2026. Brazil's initial Gripen E, 39-6001, first flew last August 26. Brazil has ordered an initial 28 Gripen Es and eight twin-seat Gripen Fs.

34th FS begins USAF's second F-35A combat deployment

ON NOVEMBER 20, the USAF announced deployment of 12 F-35As in support the United States Air Force Central Command mission – the second time the service's Lighting IIs have taken on a combat assignment in the Middle East. An accompanying photo showed F-35 pilots from the 388th and 419th Fighter Wings (FW) preparing to depart Hill Air Force Base, Utah, for Al Dhafra Air Base in the United Arab Emirates on November 13.

The latest combat deployment is by the 34th Expeditionary Fighter Squadron (EFS) and involves pilots from the active-duty 34th Fighter

Squadron (FS) and the Air Force Reserve's 466th FS. Col Steven Behmer, 388th Fighter Wing commander, described the deployment to the UAE as a "short-notice tasking". The 4th FS had returned to Hill two weeks previously, following a six-month rotation to Al Dhafra (see *Hill F-35As return from Middle East*, December 2019, p7). This was the USAF's first F-35A combat deployment.

The 388th and 419th FW are the service's first combat-capable F-35A units. The active-duty 388th FW and Air Force Reserve 419th FW fly and maintain the jet in a Total Force partnership. By the end of 2019, Hill was scheduled to be home to 78 F-35As.



Pilots with the 388th and 419th FWs prepare for launch from Hill AFB on November 13. USAF/R Nial Bradshaw

US begins operations at new air base in Niger

US AFRICA Command announced on November 1 that it had commenced operations from Nigerien Air Base 201 in Agadez, central Niger.

The base will be primarily used to support the fight against extremist militants

throughout the Sahel region, which runs coast-to-coast across Africa and includes parts of Mali, Sudan and Chad. MQ-9 Reapers began flying intelligence, surveillance and reconnaissance missions from the base the same

week, while USAF C-130s have also conducted resupply missions into the base as part of limited flying operations that began last August 1. The airfield's single runway is 6,200ft (1,920m) long and can also support C-17s, but is not

intended for operations by fighters, bombers or tankers.

In a news release, Gen Jeff Harrigan, commander US Air Forces in Europe and US Air Forces Africa, explained: "The location in Agadez was selected in

conjunction with Niger due to the geographic and strategic flexibility it offers to regional security efforts."

Nigerien Air Base 201 was supposed to be fully operational by the end of 2018, but construction was delayed by poor weather.



First deliveries for second Israeli F-35 squadron

A FURTHER two F-35s have been delivered to the Israeli Air Force (IAF). The Adirs, 930 (c/n AS-20) and 932 (c/n AS-21), arrived at Nevatim Air Base, Israel, from Lajes in the Azores on November 20, completing the final leg of their ferry flight from the US. These are reported to be the first aircraft scheduled to join the IAF's second F-35I unit, 116 'Defenders of the South' Squadron.

All previous deliveries to Nevatim have been to the first F-35I unit, 140 'Golden

Eagle' Squadron, which is now equipped with 18 of the type. The latest arrivals are the 20th and 21st production aircraft, but the 19th and 20th to be delivered.

One of the earlier production examples, the 15th (AS-15), remains in the US undergoing modifications at Lockheed Martin's Fort Worth, Texas, facility. Prior to the latest aircraft, the most recent deliveries had been on September 15 – see *Two more F-35Is delivered to Israel*, November, p21. **Dave Allport**



Above: A USAF C-130J from the 37th Airlift Squadron at Ramstein Air Base, Germany, takes off from Nigerien Air Base 201, during limited, visual flight rules (VFR) operations last August 3. USAF/Staff Sgt Devin Boyer

Left: Ground crew apply the markings of 116 'Defenders of the South' Squadron on the air intake of an F-35I at Nevatim AB. IAF

The first of five NATO RQ-4D aircraft landed at NAS Sigonella, Sicily, at 1646hrs local time on November 21, after departing Palmdale at 1000hrs local time on November 20. NATO



NATO receives first AGS Global Hawk

THE INITIAL RQ-4D Global Hawk high-altitude long-endurance (HALE) unmanned aerial vehicle (UAV) for the NATO Alliance Ground Surveillance (AGS) programme arrived at Naval Air Station Sigonella, Sicily, on November 21.

The first of five RQ-4Ds for NATO touched down following a 22hr flight from the Northrop Grumman facilities in Palmdale, California.

AGS is being developed with significant contributions from 15 alliance members – Bulgaria, Czech Republic, Denmark, Estonia, Germany, Italy, Latvia, Lithuania, Luxembourg, Norway, Poland, Romania, Slovakia, Slovenia and the United States. The asset will be collectively owned and operated by all NATO states, with all members having access to the data it acquires.

Based on the USAF Global Hawk Block 40, NATO's RQ-4D is fitted with the Northrop Grumman Multi-Platform Radar Technology Insertion Program (MP-RTIP) radar with a ground moving target indicator (GMTI), synthetic aperture radar (SAR), air track, concurrent moving target indication, cued search and ground high-resolution radar modes.

All five RQ-4Ds for the AGS

are currently at different stages of developmental test flying. Once each arrives in Sigonella, a verification phase will start, to ensure full compliance of the system. The entire AGS system will be handed over to the NATO AGS Force once it has completed its testing and performance verification. Initial operational capability is expected for the first half of 2020.

Major upgrade for NATO E-3A

NATO HAS announced signature of a US\$1bn contract to modernise its fleet of E-3A Airborne Warning and Control System (AWACS) aircraft. NATO Secretary General Jens Stoltenberg and the president of Boeing International, Sir Michael Arthur, met at Melsbroek air base in Brussels on November 27 to sign off the deal for the Final Lifetime Extension Programme (FLEP).

The third and final stage of NATO AWACS modernisation is intended to ensure the 14-strong Sentry fleet will remain in service until 2035. The aircraft will receive "sophisticated new communications and networking capabilities", including a glass cockpit, updated radar and communication systems, and new data transfer systems suitable for multi-domain command-and-control operations.

RAF Typhoons on patrol in Iceland

RAF TYPHOON FGR4s from No 1 (Fighter) Squadron from RAF Lossiemouth in Scotland arrived in Iceland on November 13 as the UK's contribution to NATO's Icelandic Air Policing mission. The jets spent a month stationed at Keflavik Air Base to protect Icelandic airspace before returning

home in mid-December.

This was the first time in more than ten years that RAF aircraft had been deployed to Iceland and the first time that the RAF conducted the Icelandic Air Policing mission. The mission was launched in 2008 and is conducted by a rotation of NATO allies. The detachment of just

over 100 personnel was commanded by Wg Cdr Mark Baker who said: "We are very excited to be here and are looking forward to starting flying operations. We have come here at the request of the Icelandic government to provide a capable force designed to offer reassurance and police

the country's airspace."

AVM Harv Smyth, the air officer commanding No 1 Group RAF, added: "I am proud to see RAF Typhoon fighters deploying once more to support and defend one of our allies as part of our ongoing commitment to NATO. This deployment is primarily designed to

offer reassurance to our friends, nevertheless, I am confident the Typhoons will secure the Icelandic skies in the same way as we do 24/7 365 at home."

Earlier in 2019 RAF Typhoons were deployed to Estonia where they conducted NATO Baltic Air Policing.



RAF Typhoon FGR4s from No 1(F) Squadron taxi at Keflavik Air Base following their flight from RAF Lossiemouth to begin the NATO Icelandic Air Policing mission. Crown Copyright

Texan T1 ZM327 '327' over the Irish Sea off the Welsh coast. The 11-strong Texan fleet is now assigned to the re-established No 72 Squadron. RAF Valley/Crown Copyright



No 72 Squadron re-forms at Valley

THE RAF's No 72 Squadron was formally re-established at RAF Valley, Wales, on November 28.

The unit had previously operated the Tucano T1 at RAF Linton-on-Ouse, North Yorkshire, in the basic flying training role. With the retirement of the Tucano (see *RAF ceases Tucano flying operations*, December 2019, p8), and the move of basic flying training to RAF Valley, the squadron is now operating the Texan T1 trainer and has been transferred from No 1 Flying Training School (1FTS) to 4FTS.

AVM 'Bunny' James, the officer commanding No 22 Group RAF and the officer responsible for all military flying training in the UK, took the salute during the formal march-on of No 72 Squadron's standard. He said: "What the squadron and RAF Valley are doing is critical to UK defence. Training fighter pilots is a national endeavour.

"Many congratulations on getting to this point and moving the military flying training system forwards. It's been a real privilege to be here today to see No 72 Squadron take the next

generation of fighter pilots towards the front line."

RAF Valley station commander, Gp Capt Chris Moon said: "It is my great privilege to be officer commanding RAF Valley and No 4 Flying Training School at this exciting time. RAF Valley is the home of military fast jet training, and alongside Nos IV and 25 Squadrons we are training the next generation.

"The whole RAF Valley team – military and civilian – have worked extremely hard to introduce Texan into service and establish No 72 Squadron here today."

700X Squadron makes first RQ-20 flights in UK

AN AEROVIRONMENT RQ-20 Puma unmanned aerial vehicle has made its first flight in the UK with the Royal Navy's 700X Naval Air Squadron. The sortie was announced on November 13 by Royal Naval Air Station Culdrose, Cornwall. Although the unit is based at Culdrose, the flight was undertaken from nearby RNAS Predannack, used as a training airfield for the unit's UAV operations.

Pilots from 700X Squadron carried out initial flight assurance checks with the Puma, flying both day and night sorties. This was immediately followed by

participation in the 3rd Commando Brigade-led Advanced Autonomous Force 2.0 exercise, bringing together recent capability enhancements procured by the Royal Navy and selected experimental equipment from industry to examine the potential use of autonomy in future operations.

On November 5, the Royal Navy announced that a team from 700X had just returned from specialist training on the Puma and RQ-12 Wasp UAV, prior to beginning to operate them in the UK (see *RPA testers at 700X NAS*, December 2019, p9). **Dave Allport**



Above: Personnel from 700X Squadron with an RQ-20 Puma during training in the US. Royal Navy

RAF Pumas on the prowl

A THREE-SHIP of Puma HC2s from RAF Benson, Oxfordshire, makes a brief stop at Yatesbury Field (the former RAF Yatesbury) near Calne, Wiltshire, as part of a training sortie on the morning of November 20. Using the callsign

'Alien', the three helicopters were primarily operated by crews from Benson's No 230 Squadron.

The RAF currently has a fleet of 23 Puma HC2s from a total of 24 that were upgraded to this standard under a £300m programme

approved in August 2009. The service life extension programme includes new engines and avionics and is intended keep the fleet in service until 2022. A first Puma HC2 performed its maiden test flight on June 21, 2011, in Marignane, France, and initial handover back to the UK Ministry of Defence took place on September 12, 2012.

While four of the helicopters were upgraded in Marignane, Eurocopter Romania rolled out the 20th Puma to have been upgraded at its Braşov facility on December 9, 2014. The first loss of an HC2 occurred on October 11, 2015, when an example crashed at Camp Resolute Support in Kabul, Afghanistan, killing five and injuring a further five on board.

Photo: Sean McRandle



In Brief

■ **RAF Rivet Joint returns from rework**
RC-135W ZZ664 returned to RAF Waddington, Lincolnshire, on November 19 after a major upgrade with L3 Technologies at Greenville, Texas, including incorporating an enhanced flight deck and mission systems. The aircraft originally departed Waddington on December 18, 2017 and the 18-month modernisation was completed last May 10. Following flight testing, it returned to the UK minus its anniversary scheme and now wears No 51 Squadron's goose insignia on the tail.

■ **HMS Queen Elizabeth completes WESTLANT 19**
The bulk of the HMS Queen Elizabeth carrier strike group returned home on December 4 after three months off the US coast as part of WESTLANT 19. The carrier strike group sailed from the UK in August to conduct operational tests with UK F-35B jets from the UK Lightning Force for the first time.

■ **Boeing 757 Tempest tested at Lasham**
Former TUI Airways Boeing 757 G-BYAW arrived at 2Excel Engineering maintenance and repair organisation (MRO) facilities at Lasham Airfield, Hampshire, on November 11, where it will be converted as a testbed for development of the Tempest future combat aircraft. The RAF awarded a contract to Leonardo to provide the test aircraft, for airborne trials of sensors and system integration from the early 2020s.

■ **HMS Prince of Wales arrives in Portsmouth**
The Royal Navy's second Queen Elizabeth-class aircraft carrier, HMS Prince of Wales (R09), arrived at Portsmouth Naval Base on November 16, ahead of handover and formal commissioning, planned before the end of 2019. The warship sailed into its new base port after an eight-week period of sea trials beginning on September 19. The carrier is scheduled to return to sea in February to begin further trials and initial work-up.

RAF Chinook assists flood defences

THE RAF Chinook Force based at RAF Odiham, Hampshire, was called in to assist at a pumping station near Doncaster, South Yorkshire, on November 10, following heavy rainfall. A Chinook flown by No 18 (Bomber) Squadron dropped 40 tonnes of aggregate

from a local quarry to ensure flood defences could continue to work properly. The aggregate was delivered onto an inaccessible spit of land enabling Environment Agency engineers to bolster drainage channels and improve the flow of water into the designated flood

plains north of Doncaster. The Chinook moved all the aggregate in ten sorties, stopping to refuel after moving the first 12 tonnes. The cargo was carried as an underslung load assisted by a team from the Joint Helicopter Support Squadron (JHSS) from RAF

Benson, Oxfordshire. Media and Communications Officer Flt Lt Chris Warr said: "The crew from Odiham and team from JHSS have done a fantastic job, working at night in a confined space with precision to deliver safely everything that was asked of them."



Chinook HC6 ZA683 from No 18(B) Squadron resting on stand 17 at Doncaster Airport on November 11 after supporting flood relief in South Yorkshire. v1images.com/Jason Nicholls

Initial two P-72Bs delivered to Guardia di Finanza



Above: 'GDF-20', the first P-72B for the GdF – still wearing the experimental registration CSX62311 – has been repainted in this new colour scheme, with the guard's griffin logo on the tail. Leonardo

THE FIRST two of four P-72Bs ordered by Italy's Guardia di Finanza (GdF, Financial Guard) were handed over during an official ceremony at Leonardo's Caselle Torinese facility on November 27.

Deliveries of the maritime patrol aircraft, based on the ATR 72-600, will be completed by 2022.

An initial order for a single P-72B – worth around €44m – was placed in July 2018 and was followed last October

9 by another deal for three aircraft, valued at over €150m, plus logistic support services; see also *Three more ATR 72MPs for Guardia di Finanza*, December 2019, p14.

The GdF's P-72B is a paramilitary version of the

P-72A operated by the Italian Air Force and is equipped with the same Leonardo Airborne Tactical Observation and Surveillance (ATOS) mission system. However, the second aircraft appears to be in a transport configuration.

Norwegian F-35A achieves IOC

NORWAY DECLARED initial operational capability (IOC) for its F-35As on November 6, becoming the third European nation to achieve the milestone with the Lightning II. After receiving 15 examples, the Luftforsvaret (Royal Norwegian Air Force, RNoAF) concluded IOC by validating that the jet can operate away from its main operating base of Ørland, with a period spent deployed to Rygge, where 50 from a planned 52 flights were flown.

Over the last two years, the RNoAF conducted operational testing and evaluation

(OT&E) of special Norwegian conditions including in winter, in the northern areas and working alongside the army, navy and special forces.

In 2020, Norway's F-35s will deploy to Iceland to conduct air policing efforts on behalf of NATO. Finally, by 2022, the RNoAF will have built

up enough F-35s, pilots and maintainers in the country for the F-35 take over the quick reaction alert mission at Evenes in northern Norway.



An F-35A taxis to the runway at Rygge.
Theodor Obrestad Schei/Forsvaret

French Caracal completes refuelling trials with Spanish KC-130H

AN ARMÉE de l'Air (French Air Force) EC725 Caracal recently completed in-flight refuelling trials with an Ejército del Aire (EdA, Spanish Air Force) KC-130H Hercules. The EdA announced on November 25 that a night flight-test campaign for the in-flight refuelling validation had been successfully completed

during the past week using an Ala 31 KC-130H and French Caracal. Because of the reduced speed of the helicopter compared with fighter aircraft, the EdA had to acquire and install a larger diameter, low-speed refuelling basket. Modifications were then made to three of Ala 31's five Hercules to accommodate

the new equipment. In addition, one was also adapted for operation with night-vision goggles.

The flight test plan was developed by Spain's Centro Logístico de Armamento y Experimentación (CLAEX, Armament and Experimental Logistics Centre), following which three flights were carried out over the sea

off the coast of Bordeaux, France. A total of 23 hook-ups were carried out at altitudes of 4,000ft (1,300m), 2,000ft (650m) and 1,500ft (500m) and a speed of 115kts. Although the Hercules is nearing the end of its operational service, the validation was a benefit to both air forces as it paves the way for similar qualification with the A400M. **Dave Allport**



A French Air Force EC725 Caracal refuels from a Spanish Air Force KC-130H Hercules. EdA

Serbian H145M and Mi-35M Hind deliveries

SERBIA RECEIVED its first two H145M light attack helicopters equipped with the Airbus Helicopters HForce weapon management system on November 29. This was followed on December 2 by delivery of four Mi-35M attack helicopters. Both types will serve with the Ratno Vazduhoplovstvo i Protivvazduhoplovna Odbrana (RV i PVO, Serbian Air Force and Air Defence).

The RV i PVO now has four H145Ms. One pair – serials 14501 and 14502 – is configured for combat search and rescue (CSAR), with the local designation H-50S. The two recently received light attack rotorcraft will receive the local military designation H-50B and the serials 14504 and 14505.

Serbia's final H145M (14503) was scheduled for delivery by the end of 2019, providing a fleet of five aircraft for the 119. mešovita helikopterska eskadrila (119th Mixed Helicopter Squadron). The unit operates from Niš air base and is subordinated to the RV i PVO's 98. vazduhoplovna brigada (98th Air Force Brigade).

RV i PVO H-50Bs are expected to be armed with indigenously developed L80-07 rocket pods carrying seven S-8 80mm (3.15in) calibre unguided rockets and the GH-78 pod carrying a single-barrel M87 12.7mm calibre machine gun with 250 rounds.

The Mi-35Ms (35101/'101', 35102/'102', 35103/'103' and 35104/'104') will serve alongside Gazelle Gama anti-tank helicopters within the 714. protivoklopna helikopterska eskadrila (714th Anti-Armour Helicopter Squadron) at Lađevci air base, in central Serbia, which is also subordinated to the 98. vazduhoplovna brigada. **Igor Bozinovski**

Germany's Open Skies A319 in Spain



Roberto Yáñez

LUFTWAFFE A319CJ 15+03 (c/n 1212) lands at Getafe, Madrid, after a 2hr flight from Cologne Bonn Airport on November 25, using the callsign 'OSY11T'. The

aircraft was recently modified by Lufthansa Technik AG in Hamburg to carry out flights under the Open Skies Treaty and was delivered to the Luftwaffe on June 21.

The aircraft was previously in use with Volkswagen Air Services under the registration VP-CVX. It is the only aircraft of its kind operated by the Luftwaffe

since the loss of the previous Open Skies Tu-154M 11+02, which collided with USAF C-141B 65-9405 off the coast of Namibia on September 13, 1997. Work on the 19-year-

old Airbus lasted 26 months and the approximately 150 modifications included the installation of three high-resolution cameras and an infrared camera system.

Rafale Cs replace Rafale Bs on Chammal

FOUR SINGLE-SEAT Rafale Cs are replacing the four two-seat Rafale Bs of the Armée de l'Air (French Air Force) operating from the country's Base Aérienne Projetée (BAP,

forward operating base) at H5/Prince Hassan Air Base, Jordan, to support

Opération Chammal. The first two landed in Jordan on November 12 after a flight from Base Aérienne 118 Mont-de-Marsan, France. They relieved two of the Rafale Bs, which will return

home after undertaking missions from Jordan for more than three months.

Initially, this leaves the complement of the contingent at the BAP as two Rafale Bs and two Cs.

This was due to change in a matter of weeks, when a further two Rafale Cs were due to arrive, enabling the remaining two B-models to return to France. **Dave Allport**



The first two French Air Force Rafale Cs, led by 104 '30-EF', taxi in at Prince Hassan AB after arriving from Mont-de-Marsan to begin replacing the Rafale Bs with the Opération Chammal detachment. Armée de l'Air

Mirage 2000Cs end Barkhane mission

FRANCE HAS withdrawn its Mirage 2000Cs from Opération Barkhane, leaving just Mirage 2000Ds to support the mission. The final pair of Armée de l'Air (French Air Force) Mirage 2000Cs departed from Base Aérienne 101 (BA 101) Niamey, Niger, on November 5 to return to France. They flew home to BA 115 Orange-Caritat, supported by a C-135FR tanker. This marked the end of the presence of this variant in

theatre, after five years of operations involving more than 5,000 flying hours.

With the 2000Cs now gone, the detachment at Niamey is equipped with four Mirage 2000Ds, fulfilling similar missions. **Dave Allport**

Right: French Air Force Mirage 2000C 118 '115-YG' taxiing at BA 101 Niamey, Niger, during an Opération Barkhane mission. The final two Mirage 2000Cs supporting Barkhane returned home on November 5. French MoD



First upgraded Phase 2 modified T129 ATAK flown



The T129 ATAK FAZ-2 prototype, P8, during its maiden flight at Mürted/Akinci on November 12. SSB

TURKISH AEROSPACE Industries (TAI) has flown the first upgraded T129 ATAK in FAZ-2 (Phase-2) configuration. The helicopter, newly built prototype P8, made its maiden flight on November 12 from TAI's facilities at Mürted/Akinci Airport. It features various upgrades, including

greater indigenous content, with visible changes including a slim new pod under the starboard stub wing, plus new antennas and sensors on the nose and tip of the stub wings. The additional equipment fit adds new electronic warfare systems, including an Aselsan laser

warning receiver, plus a new radio frequency jammer, radar warning receiver and Aselsan 9681 VHF/UHF radio. Payload has been increased to allow carriage of additional weapons and cater for the extra systems. When announcing the first flight, Dr Ismail Demir, director

of Turkey's Savunma Sanayii Başkanlığı (SSB, Presidency of Defence Industries), said that, following an intensive testing period, the first example of the new variant would enter service in mid-2020. The earlier FAZ-1 version is in service with the Turkish Land Forces

Command and the Turkish Gendarmerie (Jandarma) Aviation Directorate. TAI has delivered 53 of the type to date, the 53rd having been delivered to the land forces on November 2. These comprise 47 now in service with the land forces and six with the Jandarma. **Dave Allport**

Second Italian-built F-35A for RNLAf



F-35A F-010 returns to Cameri after its initial test flight. Callsign 'Lightning 11' was flown by a Lockheed Martin test pilot and accompanied by an Italian Air Force F-2000A chase plane. Marco Muntz

THE SECOND F-35A for the Koninklijke Luchtmacht (Royal Netherlands Air Force, RNLAf) to be built at the Final Assembly and Check-Out (FACO) line in Cameri, Italy, made its maiden flight on November 4. F-35A F-010 (AN-10, FMS 17-5309) was expected to be delivered to Leeuwarden Air Base in

December to continue the process of re-equipping 322 Squadron, the first front-line RNLAf F-35 unit.

The initial Netherlands-based F-35A arrived at Leeuwarden AB on October 31 when the first example built for the RNLAf at Cameri, F-009 (AN-09, FMS 17-5308), touched

down – see RNLAf F-35A arrives in the Netherlands, December 2019, p12.

The first eight RNLAf jets were built by Lockheed Martin in Fort Worth, Texas, and are all permanently based in the US. The final 29 of the 37 F-35s ordered so far will be built in Italy. The Cameri FACO will

deliver eight F-35As to the RNLAf annually, the next aircraft being F-011 scheduled for April/May.

By the end of 2019 it was also expected that the two RNLAf F-35As participating in the Operational Test and Evaluation (OT&E) phase at Edwards Air Force Base, California, would be

transferred to Luke AFB, Arizona, after the conclusion of the flight-test campaign.

They will join the Netherlands Opleidings Detachment F-35 (NODF-35), the Dutch F-35 training detachment, part of the 308th Fighter Squadron at Luke AFB, to augment six F-35s already in use for pilot training.

First AW169M for Guardia di Finanza

LEONARDO HAS delivered the first of 22 AW169M twin-engine helicopters to Italy's Guardia di Finanza (GdF, Financial Guard). A handover event for MM81962 'GF-501' (c/n 69095) was held at Leonardo's Vergiate plant on November 12. The initial delivery is part

of a contract worth €280m signed at the end of 2018, including a complete support and training package.

This could be extended in future for further services with an additional value of €100m.

Delivery of all 22 aircraft is expected to be completed by 2024, complementing a

fleet of 14 AW139 helicopters. The AW169M obtained military certification from ARMAEREO, the Italian Directorate of Air Armaments, last September.

Right: The first AW169M for the GdF is MM81962 'GF-501'. It's seen here still wearing its experimental registration CSX81962. Leonardo



Hungary receives first two H145Ms

THE FIRST two of 20 H145M helicopters were delivered to the Hungarian Defence Forces (HDF) at the MH 86. Szolnok Helikopter Bázis (86th Helicopter Base) at Szolnok on November

18. The aircraft – '01' and '02' – were flown from the Airbus Helicopters facility in Donauwörth, Germany, to Szolnok on November 18, by mixed German-Hungarian crews, with

a fuel stop in Austria. They wore the temporary German delivery registrations D-HADI and D-HMBF, respectively. The Magyar Légierő (Hungarian Air Force,

HUNAF) was scheduled to receive two more H145Ms ('03' and '04') by the end of 2019 with delivery of the remaining 16 due for completion by the end of 2021.



The first two H145Ms initially landed at Budaörs, near Budapest from where they made a promotional flight over the Hungarian capital, before flying to Szolnok. Benedek Levente

Tactical Leadership Programme 2019-04

THE FINAL course in NATO's Tactical Leadership Programme (TLP) for 2019 took place at Albacete air base in Spain on November 21. The exercise attracted foreign participants in the form of Eurofighters from the Luftwaffe's Taktisches Luftwaffengeschwader 31

(TaktLwG 31) and TaktLwG 74, plus Italian Air Force Tornados from the 6° Stormo and AMXs from the 51° Stormo. Meanwhile, the Spanish Air Force provided Hornets from Ala 12 and 46 and Eurofighters from Ala 14. Although United States Air Forces in Europe (USAFE)

F-16s from Aviano Air Base in Italy had been expected, they withdrew at the last moment due to operational commitments. Other external assets involved in TLP 2019-04 were two Italian Air Force 15° Stormo HH-139As participating in combat search and rescue

(CSAR) missions, a C-27J from the 46ª Brigata Aerea operating as a slow-mover, a German GFD Learjet for electronic warfare and a pair of AWACS – a NATO E-3A and an RAF E-3D Sentry AEW1. The next TLP flying course is scheduled for February 10-28.



Taxiing to Albacete's active runway on November 18 to participate in one of the CSAR missions, Luftwaffe TaktLwG 74 Eurofighter 30+68 still wears its Luftwaffe 60th anniversary colour scheme applied in 2016 for the ILA Berlin Air Show. Roberto Yáñez

S-100 integrated with Dixmude

THE DIRECTION générale de l'armement (DGA, the French defence procurement agency) announced that Schiebel's Camcopter S-100 unmanned air system (UAS) is now fully integrated with the French Navy Mistral-class amphibious helicopter

carrier Dixmude. According to the manufacturer, this is the first time in Europe that a rotary-wing UAS is fully operational and integrated with the defence system of an amphibious helicopter carrier. Necessary modifications

of the ship took place last spring, after a successful operational two-year testing phase ensuring interoperability between the vessel and the UAS. The video output from the S-100 was integrated in the onboard combat

system, adding to the helicopter carrier's intelligence, surveillance and reconnaissance capabilities. As contracting authority, the DGA managed all technical stages, in close collaboration with the French Naval Group and Schiebel.

In Brief

Spain to buy 24 PC-21 trainers

Spain is to spend €205m acquiring 24 PC-21 turboprop trainers (local designation E.27) to overhaul its training fleet. The Pilatus product was reportedly chosen ahead of the Beechcraft T-6A and Leonardo M-345. The PC-21 should be ready to begin basic training around 2021, when it's planned to start retiring the C-101.

Romania approves more F-16s

The Romanian government has approved the purchase and modernisation of five more former Portuguese F-16AMs. Under a draft law passed by the government on November 28, the first four aircraft are expected to arrive in Romania in 2020, with the last to follow in 2021.

Additional Seahawks for Spain

Spain has approved acquisition of two additional SH-60Fs (plus two examples for use as spares) as Excess Defense Articles, at an estimated value of €36m. The Seahawks were retired by the US Navy between 2008 and 2014, with an average of 7,000 flight hours remaining. Under its Naval Tactical Transport Helicopter Program, Spain aims to acquire eight SH-60Fs as an interim SH-3 replacement because of delays to the NH90.

Norway disposes of Hercules

Norway has sold five C-130Hs to the US-based Coulson Aviation, for conversion as firefighting aircraft. The transports were sold for \$US4.5m and formal acceptance by the new owner was planned for late 2019 or early 2020. Norway's final C-130Hs were withdrawn from use in May 2008 and the five aircraft were stored with the 309th Aerospace Maintenance and Regeneration Group in Arizona.

France launches ARCHANGE

France has officially started work on its ARCHANGE signal intelligence aircraft programme, which will replace the air force's two C-160 Gabriels with three modified Dassault Falcon 8Xs carrying a Thales mission payload. A first modified Falcon 8X is expected to be delivered from 2025.

Postcard from Prague-Kbely



Above: A JAS 39C and an L-159A escort A319CJ serial 3085 (c/n 3085) from the 241. dopravní letka (241st Transport Squadron). The primary role of the 241st is transport of government officials and units of the Czech Army at home and abroad. Other duties include carrying NATO personnel or special flights on behalf of the Czech Republic security agencies. Acquired in 2007, the A319CJ can be outfitted with medical equipment for humanitarian operations to evacuate Czech citizens from conflict areas. The 241. dopravní letka inventory includes two A319CJs, two Yak-40s and a single CL-601 Challenger. **Below:** C295M serial 0453 (c/n 069) from the 242. transportní a speciální letka (242nd Transport and Special Squadron) taxis at Prague-Kbely. The 242nd is responsible for transporting troops and materiel, as well as medical evacuation. The C295M - which has been stationed at Kbely since 2010 - is also used to support UN international observer missions. The squadron has four C295Ms, four L-410UVP-Es and a pair of L-410FGs. Another two C295Ms are on order for delivery in 2020. All photos Bernd Kienle



This month, AFM contributor Bernd Kienle provides a photographic report from the 24. základna dopravního letectva (24. zDL, 24th Transport Aviation Base) in Prague-Kbely, in the

northeast of the Czech capital, where plans for the construction of a military airfield were laid as long ago as November 1918. Today, the base is home to the fixed-wing transport arm of the Vzdušné síly Armády

České republiky (VzS AČR, Air Component of the Army of the Czech Republic). Since the country's accession to NATO in 1999, the transport fleet has been extensively modernised and the base is home to three squadrons.

History

In spring 1920, Prague-Kbely was home to extensive airfield infrastructure and numerous hangars, some of which are still in use. By the beginning of 1938, the 4th Air Regiment with Avia B-534 fighters and the 6th Air Regiment with Aero Ab.101 and Avia B-71 bomber and reconnaissance aircraft were based at Kbely. In the early years of the war, the German Luftwaffe used the hangars for aircraft repairs.

Immediately after the end of the war, an urgent need to develop military air transport was recognised. In July 1945, a transport squadron was established with Soviet and British-supplied C-47 and Dakota aircraft. From 1952, two such squadrons were stationed at Kbely, plus a third flying Soviet Li-2s. The first Mi-2 and Mi-4 helicopters were delivered to the resident transport unit in 1956. In August 1959, the first Il-14 (Avia 14) transports arrived at Kbely; later, these were also stationed at Prostějov and Mošnov. In the late 1970s and 1980s, the Czechoslovak Air Force transport fleet introduced Mi-8 helicopters, as well as An-12s and An-24s. From 1977, the first locally built L-410 Turbolets were delivered, followed by An-26s and, from 1983, Mi-17 helicopters. An-24, Yak-40, Tu-134 and Tu-154 aircraft were procured for the transport of government officials and other VIP flights, stationed in Prague-Kbely. The Il-14 was retired by 1985, followed by the An-12 in 1994 and the Tu-134 in 1997.

Under a presidential order of May 5, 1990, the resident 3rd Air Transport Regiment was named T G Masaryk, after the first president of Czechoslovakia, who served from 1918 to 1935. Later, the unit was renamed the 6th Transport Air Base.

Extensive modernisation was carried out around Prague-Kbely in 1996-98 and included reconstruction of the hangars - preserving their original, historic form - together with the building of a modern airport terminal.



Left: Seen approaching Ostrava Airport in the northeast of the country is Yak-40 serial 0260 (c/n 9940260) of the 241. dopravní letka. The 'Codling' was acquired during the communist era for the transport of the then Czechoslovak government and other VIP flights, operating from Prague-Kbely alongside examples of the An-24, Tu-134 and Tu-154. **Below:** Retired An-26 military transports can be found parked at Prague-Kbely. ER-AUD is among four former Czech Air Force 'Curls' stored outside the airport's museum. All wear Moldovan civil registrations, but they were never delivered to their intended customer, AIM Aviation, who reportedly acquired them in 2016.



Above: Five W-3W Sokol helicopters stand ready for search-and-rescue service at Plzen-Line. The W-3Ws provided valuable services during the floods that affected the Czech Republic in 1997 and 2002. This particular Sokol, serial 0718 (c/n 370718), is specially marked since it was the first of the type in the world to achieve 5,000 flying hours – note the '5000' legend on the tailfin.



Above: Awaiting its next mission at Kbely is Mi-17 serial 0849 (c/n 108M49) from the 243. vrtulníková letka (243rd Helicopter Squadron). One of the main tasks of this squadron is transporting government officials and high-ranking representatives of the Czech Army within the country. The 243rd also includes the base at Plzen-Line, where five W-3W Sokols are stationed for search-and-rescue operations. In total, the 243rd has three Mi-8s, one Mi-8P (a converted Mi-9), four Mi-17s and ten W-3W Sokol aircraft. **Left:** The 243. vrtulníková letka operates a fleet of three 11-seat Mi-8PS-11 'Hips' for VIP flights; all wear a red, white and blue colour scheme. Among these 'Salon'-configured aircraft is serial 0835 (c/n 10835), marked as a Mi-8S.



L-410FG serial 1526 (c/n 851526) from Prague-Kbely. This unusual aircraft is specially equipped for aerial surveillance and calibration of radio-technical systems at military airfields throughout the Czech Republic.

KC-46A completes Wing Aerial Refueling Pod tests



Above: A KC-46A parked on a ramp at Edwards AFB, fitted with a Wing Aerial Refueling Pod (WARP) on each wing. The WARP system allows the Pegasus to simultaneously refuel two aircraft via drogue chutes. USAF/Giancarlo Casem

TESTING OF one of the key features of the USAF's new KC-46A was completed recently at Edwards Air Force Base, California. The resident 412th Test Wing announced on November 21 that the

Wing Aerial Refueling Pods (WARPs) had been successfully trialled with an AV-8B, F/A-18D and EA-18G. The WARPs allow the Pegasus to simultaneously refuel two aircraft, compared

with the centreline drogue system, which can only refuel one at a time. As fighters routinely arrive in pairs to refuel, the WARP system halves the time the aircraft are away from the fight.

Following successful completion of the connections, engineers have a multitude of data to review before it is certified by the Aerial Refueling Certification Agency.

They have to evaluate the performance of the WARPs prior to fielding the capability, including looking at the free air stability, hose reel response, fuel system and human factors. **Dave Allport**



The final US Navy E-2C Hawkeye Group II, assigned to VAW-124 'Bear Aces', taxis in at Naval Station Norfolk, following the sundown ceremony for this variant. US Navy/Mass Communication Specialist 3rd Class Samantha Jenkins

Last US Navy E-2C Group II retired

AS THE US Navy continues to modernise its fleet, the service has retired its final E-2C Hawkeye Group II Navigation Upgrade (NAVUP) aircraft. The last example, coded 'AJ-606', serial unconfirmed, was assigned to Carrier Airborne Early Warning Squadron 124 (VAW-124) 'Bear Aces' at Naval Station Norfolk, Virginia. It made a farewell flight at Norfolk

on November 19 as part of a sundown ceremony to mark retirement of the last of this variant. When deployed, VAW-124 had been assigned to Carrier Air Wing 8 (CVW-8) on board the USS *George H W Bush* (CVN 77). Earlier model E-2Cs are now being progressively replaced by the E-2D Advanced Hawkeye. **Dave Allport**

Disposal of 916th ARW KC-135s under way

FIVE OF the USAF Reserve Command/916th Air Refueling Wing (ARW)/77th Air Refueling Squadron (ARS) 'Totin Tigers' KC-135Rs have been divested to date as the wing prepares to transition to the KC-46A. The fifth and most recent departure from the unit's home at Seymour Johnson Air Force Base, North Carolina, was 57-1456 on November 18. The unit is scheduled to lose all 12 of its KC-135Rs before beginning to work up on the KC-46A in Fiscal Year 2020.

The first Stratotanker to leave was 62-3537, which departed on October 16 for Fairchild AFB, Washington, to join the 92nd ARW. The

second, 63-8014, left on October 22, followed by the third, 61-0313, on October 29, both also heading for the 92nd ARW. The fourth departure was 57-1437.

All 12 KC-135Rs are due to transfer to the 92nd ARW by February, bringing the fleet up to 59 of the type. They will be flown by the 97th ARS, which was formally reactivated in a ceremony at Fairchild on October 18. The unit had previously been part of the 92nd Operations Group at Fairchild until being deactivated on September 30, 2004. A new maintenance unit will also be formed to support the additional tankers. **Dave Allport**



Above: USAF KC-135R 62-3537, the first of 12 being divested by the 916th ARW, on the ramp at Fairchild AFB on October 16 after being delivered from Seymour Johnson to join the 92nd ARW. USAF/Staff Sgt Mary McKnight

Final flight of last active-duty US Navy P-3C

AFTER OVER 57 years of operations, the US Navy has completed the last active-duty flight with the P-3C Orion. The final sortie, carried out by P-3C AIP 162998, took place on November 4 at Naval Air Station Whidbey Island, Washington. Although the active-duty P-3C units have transitioned to or are in the process of converting to the new P-8A Poseidon, a number of US Naval Reserve squadrons will continue to fly the type until it is completely phased out in 2023.

The final operational deployment with the type was conducted on October 9, when the last P-3C from Patrol Squadron 40 (VP-40) 'Fighting Marlins' returned home to Whidbey Island after a period working in the US Fifth and Seventh Fleet



areas of operations. VP-40 was the sole remaining active-duty unit to fly the P-3C. The final, split deployment by VP-40 had seen its aircraft detached to

Isa Air Base, Bahrain, and Kadena Air Base, Japan. At least one aircraft had also been forward deployed to Camp Lemonnier, Djibouti. **Dave Allport**

Above: Retired Admiral William Moran and Vice Admiral Mike Moran, Principal Military Deputy Assistant Secretary of the Navy (Research, Development and Acquisition), pose for a group picture with sailors from various commands under Commander, Patrol and Reconnaissance Wing 10 prior to the final active-duty flight on a US Navy P-3C. US Navy/MCS 2nd Class Rashaan Jeffery

USAF retires CALCM



Airmen from the 2nd Munitions Squadron transport the final CALCM to be demilitarised at Barksdale AFB on November 20. USAF/Airman 1st Class Jacob B Wrightman

THE USAF's Air Force Global Strike Command has withdrawn from service the final examples of its AGM-86C/D Conventional Air-Launched Cruise Missile (CALCM). The last CALCM 'package' was downloaded and disassembled at Barksdale Air Force Base, Louisiana, on November 20.

Design work on the nuclear-armed AGM-86B Air-Launched Cruise Missile began in 1974 and developing a conventional derivative was prompted by the April 1986 raid on Libyan military facilities, Operation Eldorado Canyon.

The first combat employment of the CALCM was in January 1991, during Operation Secret Squirrel, in which

seven B-52Gs took off from Barksdale and launched 35 CALCMs against Iraqi infrastructure. This was the first time GPS had been used to guide a missile to its target. Since then, the CALCM served as primary weapon system on the B-52 and was used in subsequent operations including Desert Strike, Desert Fox, Allied Force, Enduring Freedom and Iraqi Freedom.

The nuclear-armed AGM-86B remains in service for the B-52H, but will eventually be replaced by the Long-Range Standoff (LRSO) weapon, which may also yield a conventional version. The LRSO programme has passed its Milestone B decision, which could lead to full-rate production in 2022.

Abraham Lincoln Carrier Strike Group supports Inherent Resolve



THE US Navy's Abraham Lincoln Carrier Strike Group (ABECSG) began air operations in support of Operation Inherent Resolve (OIR) on November 22. Embarked in the USS Abraham Lincoln (CVN 72),

Carrier Air Wing Seven (CVW 7) undertook close air support and defensive counter-air support missions "as part of broader CENTCOM [US Central Command] counter-terrorism operations in the region", according to a

statement from the navy. The ABECSG transited through the Strait of Hormuz and into the Arabian Gulf on November 19. The strike group has been in the US Fifth Fleet area of operations (AOO) since last May.

With Abraham Lincoln as the flagship, deployed strike group assets include staff, ships and aircraft of Carrier Strike Group 12, Destroyer Squadron (DESRON) 2, USS Leyte Gulf (CG 55) and CVW-7.

Above: An F/A-18F from Strike Fighter Squadron 103 (VFA-103) 'Jolly Rogers' launches from the aircraft carrier USS 'Abraham Lincoln' in the Arabian Gulf on November 22. US Navy/Mass Communication Specialist 3rd Class Michael Singley

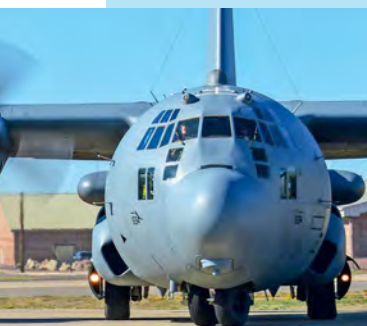
55th ECG airmen return home

AFTER OVER 15 years of continuous deployment, airmen assigned to the USAF's 55th Electronic Combat Group (ECG) returned home to Davis-Monthan Air Force Base, Arizona, on October 7, after the 43rd Expeditionary Electronic Combat Squadron (EECS) was inactivated on September 30. The latest three-month deployment involved 11 airmen and one EC-130H Compass Call aircraft.

The 55th ECG, a geographically separated unit from Offutt AFB, Nebraska, had deployed airmen to the 43rd EECS since 2003 in support of Operations Southern Watch, Iraqi Freedom, Enduring Freedom, Freedom Sentinel, Resolute Support and Inherent Resolve.

Since 2015, the unit recorded more than 5,700 flying hours on over 760 sorties in support of Operation Inherent Resolve. According to the air force, these missions led to the capture or killing of more than 12,000 enemy combatants.

While the 43rd Electronic Combat Squadron (ECS) is composed of more than 140 airmen and five EC-130Hs that perform electronic attack missions to degrade enemy command and control networks, the 55th ECG trains and equips Compass Call crews to meet combatant commander requirements around the globe. Although the 43rd EECS has been inactivated, the 55th ECG will continue to support deployed operations around the world.



Above: A USAF EC-130H taxis back to the 55th ECG at Davis-Monthan AFB on October 12. This is one of 12 Compass Call aircraft assigned to the 55th ECG. USAF/Airman 1st Class Jacob T Stephens

First AH-1Z delivered to HMLA-775



The first Viper for HMLA-775, BuNo 168421, is not a new helicopter. It was formerly used by HMLA-469 'Vengeance', also based at Camp Pendleton and is a rebuilt AH-1W. USMC/Pfc Seth G Merz

MARINE LIGHT Attack Helicopter Squadron 775 (HMLA-775) 'Coyotes' has received its first AH-1Z attack helicopter as it begins to transition to the aircraft from the AH-1W. Based at Marine

Corps Air Station Camp Pendleton, California, the unit received its first Viper on November 18. The squadron is part of the US Marine Corps Forces Reserve's Marine Air Group (MAG) 41, assigned

to the 4th Marine Aircraft Wing (MAW). The 'Coyotes' now operate the AH-1Z alongside their UH-1Y Venom fleet. HMLA-775 is the last squadron at Camp Pendleton to transition to the AH-1Z.

The next USMC unit to transition to the 'Zulu' will be the USMC Reserve Forces' HMLA-773 'Red Dogs/Cobras' of MAG-49, 4th MAW, based at McGuire Field, New Jersey.

Draken Mirage F1s take to the air

DRAKEN INTERNATIONAL completed a maiden flight of a first regenerated Mirage F1 at Lakeland Linder International Airport, Florida, on November 12. The aircraft involved was two-seat Mirage F1B N552EM. Draken acquired 22 former Spanish Air Force Mirage F1s in 2018 to support USAF adversary air training. The jets are being regenerated by Draken with assistance from Paramount Aerospace Systems.

A first single-seat Mirage F1M returned to the air on November 22, followed by a second single-seater four days later. The company aims to begin using the fighters operationally from 2020.



Above: Mirage F1B N552EM deploys its brake 'chute' at Lakeland Linder International Airport after its first post-regeneration flight. Paramount Group

On October 18, Draken International, along with three other ADAIR companies – Airborne Tactical Advantage Company (ATAC), Top Aces

and Tactical Air Support Inc (TacAir) – was awarded a \$6.4bn contract to provide combat readiness training under the US Air Force's

Combat Air Forces (CAF) ADAIR programme. Each company must now bid to support the 12 sites that are earmarked for these services.



The first of two new HH-60Ws for the 413th Flight Test Squadron after its arrival at Eglin AFB. USAF/Samuel King Jr

HH-60W arrives at Eglin

AN INITIAL HH-60W combat rescue helicopter for the USAF arrived at Duke Field, Eglin Air Force Base, Florida, on November 6. The first of two new aircraft will be

used for developmental work with the 413th Flight Test Squadron, part of the 96th Test Wing. The second HH-60 arrived the following day. Since the HH-60W's

experimental flight clearance does not yet allow instrument flight or the use of its transponder, the aircrew flew the 5hr ferry flights from the Sikorsky

Developmental Flight Center under visual flight rules.

The USAF is contracted to purchase 113 HH-60Ws to replace its fleet of HH-60G helicopters.



B-1s deploy to Saudi Arabia

THE USAF's B-1B bomber has returned to the Middle East on deployment for the first time since leaving the region last March. An undisclosed number of Lancers from the 34th Bomb Squadron at Ellsworth Air Force Base, South Dakota, touched down at Prince Sultan Air Base (PSAB), Saudi Arabia, on October 25. At

Left: A USAF B-1B flies in the US Central Command area of operations on October 25. The bomber flew directly from its home station of Ellsworth AFB. USAF/Master Sgt Joshua L DeMotts

least four B-1s flew directly to PSAB from Ellsworth. According to a statement from Air Forces Central Command, the deployment "demonstrates PSAB's ability to conduct combat ops."

As well as B-1s, the Saudi base now hosts USAF F-22As, US Navy E/A-18Gs and Patriot air defence systems. The Pentagon also announced deployment to the country of another two fighter squadrons, an air expeditionary wing, further Patriot batteries and a Terminal High Altitude Area Defense (THAAD) system.

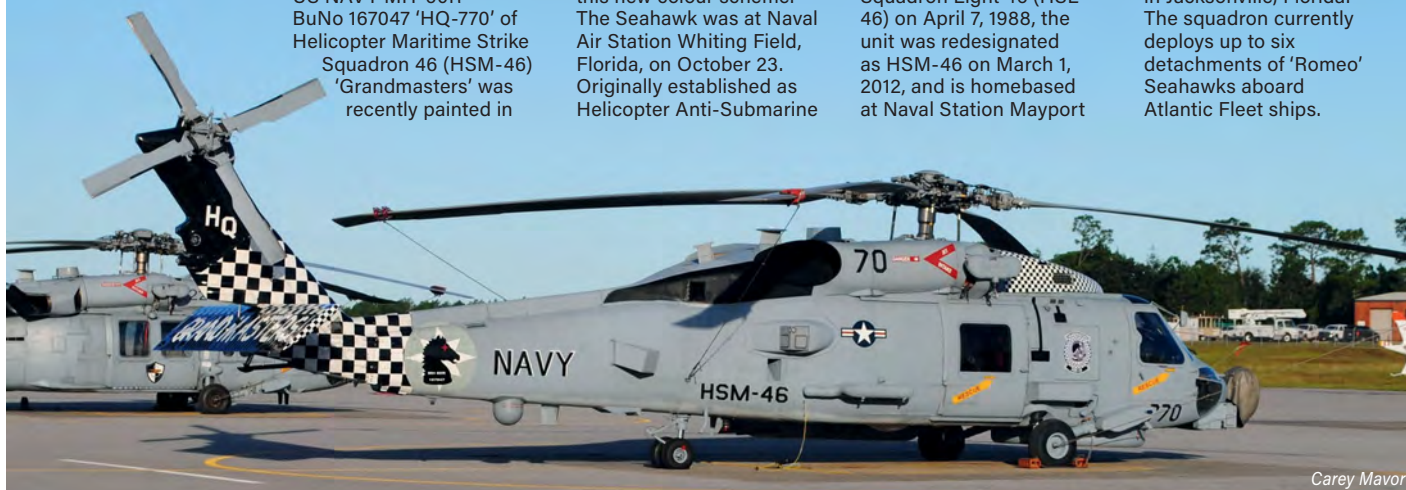
New look for the 'Grandmasters'

US NAVY MH-60R BuNo 167047 'Hq-770' of Helicopter Maritime Strike Squadron 46 (HSM-46) 'Grandmasters' was recently painted in

this new colour scheme. The Seahawk was at Naval Air Station Whiting Field, Florida, on October 23. Originally established as Helicopter Anti-Submarine

Squadron Light 46 (HSL-46) on April 7, 1988, the unit was redesignated as HSM-46 on March 1, 2012, and is homebased at Naval Station Mayport

in Jacksonville, Florida. The squadron currently deploys up to six detachments of 'Romeo' Seahawks aboard Atlantic Fleet ships.



Carey Mavor

In Brief

■ Battle for ANG Lightning II basing

Michigan's lawmakers are campaigning for the USAF to switch its F-35 Air National Guard basing plans, moving the F-35A to Selfridge Air National Guard Base (ANGB) in the state instead of Truax Field ANGB in Wisconsin. In 2017, the USAF selected Truax Field and Dannelly Field in Alabama as the preferred locations for an ANG F-35A unit. Selfridge is currently home to ANG F-10Cs. Truax was expected to be the second ANG F-35A base, with jets arriving from early 2023.

■ 'BUFFS' demonstrate capabilities

Recently, the USAF conducted B-52H exercises simulating multiple

launches of the bombers from different locations. During the November manoeuvres, B-52s from three bases completed two complex, long-range training missions in less than a week. On the 21st, B-52s from Minot Air Force Base, North Dakota, and Barksdale AFB, Louisiana, flew a combined exercise to the centre of the US. Two Minot B-52s flew to a range in Kansas, while another two Barksdale B-52s flew to South Dakota to strike target areas simultaneously. A day earlier, two 'BUFFS' from the 69th Expeditionary Bomb Squadron deployed to Andersen AFB, Guam, and flew 19.5hr bombing training missions to the Pohakuloa Training Area on Hawaii.

For the first time, Pacific Air Forces integrated the B-52's targeting pod with an off-board laser spot track from a US Army RQ-7 Shadow unmanned aerial system.

■ AFSOC eyes CV-22 replacement

US Air Force Special Operations Command is examining options for the replacement of its fleet of CV-22 tiltrotor aircraft. Brig Gen David Harris, the command's director of strategic plans, programmes and requirements, confirmed that the Osprey's successor would likely feature improved cargo-carrying capability, and potentially low-observable technology. It might also be required to operate at speeds of 450-500kts, compared to around

240kts for the Osprey.

■ End in sight for KC-46 cargo problems

In December, the USAF planned to begin installing a fix to the problem that is restricting the KC-46 from carrying passengers and cargo. The latest Category One deficiency was identified in September and relates to defective locks that hold cargo and passenger seats in place in the cargo bay. The air force plans to fix two Pegasus aircraft per week, completing the work in March 2020.

■ US Air Force looks to axe platforms

The USAF is looking again at retiring complete aircraft fleets as it aims to free up funds for modernisation programmes. The service will

propose retiring platforms as part of its Fiscal Year 2021 budget request and will likely earmark for withdrawal types that are less suitable for fighting in contested environments against near-peer nations such as China or Russia.

■ Barksdale B-52s back from Europe

Four B-52Hs and around 300 airmen returned to Barksdale Air Force Base, Louisiana, in mid-November after a four-week task force deployment to Europe that included training exercises throughout that continent and the Middle East. Stratofortresses from the 2nd Bomb Wing flew 32 sorties while deployed to RAF Fairford, Gloucestershire, and trained with 13 partner nations.

Four Su-30SMs delivered to Belarus

AN INITIAL four of the 12 Su-30SMs ordered by the Belarusian Air Force and Air Defence (VPS i VSPA) have now been delivered. The first pair, '01 Red' and '02 Red', arrived at the 61st Fighter Aviation

Base at Baranavichy on November 13. The second pair '03 Red' and '04 Red', followed on November 20. The contract for 12 aircraft was signed with Irkut Aviation Corporation in June 2017, but funding problems led to

some delay in proceeding with the deal. A final three-year agreement was signed during the 9th International Exhibition of Arms Military Machinery, held in Minsk last May. With all issues resolved, all four aircraft scheduled

for delivery in 2019 arrived in accordance with the deal. The remaining aircraft will be delivered at a rate of four per year, with the next batch in 2020 and the remainder in 2021. See p60-65 for more on the VPS i VSPA. **Dave Allport**

Below: VPS i VSPA Su-30SM '01 Red' arrives at Baranavichy on November 13. The aircraft was in the first pair to be delivered to Belarus. Belarusian MoD



First series production Su-57 prepares for delivery

THE FIRST production Su-57, '01 Blue' (c/n 51001), is seen undergoing final assembly at Komsomolsk-on-Amur. The Russian defence ministry announced on November 8 that the Russian Aerospace Forces were scheduled to receive the first series production

aircraft by the end of 2019. During a visit to the factory on that date, Deputy Minister of Defence Aleksey Krivoruchko said a second aircraft is in production for delivery in 2020 and under current plans, the air force is expecting to receive 76 of these aircraft by 2028.



One of two Mi-8MTs donated to Kyrgyzstan. Armed Forces of Kyrgyzstan

Russia donates two Mi-8MTs to Kyrgyzstan

RUSSIA TRANSFERRED more military equipment to Kyrgyzstan during a ceremony at Kant air base near Bishkek on November 27. Kyrgyzstan received two Mi-8MT transport helicopters, as well as several P-18 ground radars. Seven months earlier, in

April 2019, Kyrgyzstan had received a pair of Mi-8MT helicopters from Russia – see *Kyrgyzstan adds Hips*, July 2019, p21. The refurbished equipment was all withdrawn from the inventory of the Russian Aerospace Forces and donated free of charge.

Su-35S for the Russian Knights

One of the new Su-35S aircraft for the Russian Knights arrives at Kubinka following its delivery flight. Russian MoD via Dave Allport



FOUR NEW production Su-35S fighters were flown from the KnAAZ plant at Komsomolsk-on-Amur to Kubinka, near Moscow, on November 12 to begin re-equipping the Russian Knights (Russkiye

Vityazi) aerobatic display team – part of the resident 237th Aviation Technology Demonstration Centre (237 TsPAT). The aircraft, which comprised Bort numbers '50 Blue', '51 Blue', '52 Blue', and '53 Blue', were delivered

by the team's pilots, who had already trained on the Su-35S at the 4th State Air Personnel Preparation and Military Evaluation Centre of Ministry of Defence of the Russian Federation (4 GTs PAP VI MO RF) in Lipetsk.

The 237 TsPAT has been subordinated to the Lipetsk centre since April 2009. Its Russian Knights team was created in April 1991 and flew the Su-27 until these were replaced by twin-seat Su-30SM jets in 2016.

Northern Fleet aviation regiments return

TWO AVIATION regiments, numbers 403 and 830, were formed at Severomorsk-1 airfield from squadrons belonging previously to the 7050th Aviation Base of Russia's Northern Fleet on December 1. In fact, they return the base to the organisational structure that existed in 2009.

The 403rd Guards Independent Composite Aviation Regiment (403 OSAP) comprises a squadron of Il-38s (including upgraded Il-38Ns) for anti-submarine warfare (ASW), and a search-and-rescue (SAR) and transport squadron with An-26, An-12, Il-18 and Tu-134 aircraft.

The 830th Independent Shipborne ASW Helicopter Regiment (830 OKPLVP) comprises a squadron of Ka-27 ASW helicopters (including upgraded Ka-27Ms) and a squadron of SAR Ka-27PS and assault-transport Ka-29 helicopters.

The status of the Mi-8 transport helicopter squadron is unclear. According to a press release from the Northern Fleet, "from the structure of the aviation base, the helicopter squadron with Mi-8 helicopters was also allocated", suggesting that a third independent unit has been created in Severomorsk-1. Logically, the Mi-8 squadron would form part of the 830th Regiment, but the statement appears to contradict this.

Severomorsk-1 air base has been undergoing reconstruction since 2012. The runway has been lengthened from 9,843ft (3,000m) to 11,483ft (3,500m). The taxiways, aircraft parking stands and other infrastructure have been built from scratch. Reconstruction of the airfield was halted in 2015-16, probably due to a lack of funding. Once the runway and one section of aircraft parking stands had been completed, the unfinished air base was reactivated in June 2018. **Piotr Butowski**

Iraqi Hercules in France



IRAQI Air Force (IQAF) C-130J YI-306 (c/n 5704) arrives at Villacoublay air base, near Paris, on November 12. The Hercules was in France to transport the Iraqi defence minister and 24 other people. It's thought

to be the first time an Iraqi C-130 has visited France. Noteworthy is the return of the pre-2004 Iraqi Air Force insignia on the rear fuselage. The IQAF announced last March that it was preparing to reinstate the historical

insignia, which to date has also been seen on Beech 350 ISR YI-156 and RC-208 YI-112.

The IQAF's Transport Wing is responsible for six C-130Js assigned to the 23rd (Transport) Squadron at New Al Muthanna Air Base,

Guillaume Normand

Baghdad. The first three Super Hercules were accepted in Baghdad in December 2012 and the remaining three were ferried to Iraq in May the following year. The unit's three C-130Es were put in storage in September 2017.

UAE to upgrade Mirage 2000-9 fleet

THE UNITED Arab Emirates (UAE) has announced a long-awaited deal to upgrade the fleet of Mirage 2000-9 fighters flown by the United Arab Emirates Air Force and Air Defence (UAEAF&AD). As part of the US\$929m modernisation, four contracts were announced during the course of the Dubai Airshow in November 2019. Dassault Aviation originally revealed UAE plans to upgrade its Mirage 2000-9 fighters at the 2017 Dubai Airshow.

Dassault has now received a US\$489.6m contract for the project, but no further details were provided, and it's unclear if the surviving 35 single-seat Mirage 2000-9EAD, 13 two-seat Mirage 2000-9DAD and eight reconnaissance-configured Mirage 2000-9RAD aircraft will all be modernised, or only a portion of the fleet.

Another contract, worth around US\$350m, goes to MBDA France for "maintenance of ammunitions" for the fighters. The other two deals went to Thales International Middle East for "maintenance and life extension services" for the Mirage 2000 at a value of US\$63.3m, plus another to MBDA France worth US\$25.3m to "provide technical support and supply spare parts for aircraft weapon systems".

Saudi PC-21 in Switzerland for repairs

ROYAL SAUDI Air Force (RSAF) PC-21 serial 2201 (c/n 177, ex HB-HWW) was seen at the Pilatus Aircraft factory at Stans-Buochs, Switzerland on November 14. This rare visitor suffered a ground accident – probably

in 2017 – and has now finally been repaired. When noted at Stans, the aircraft was apparently ready for its ferry flight back to Saudi Arabia, where it's operated by 22 Squadron at King Salman Air Base, Riyadh.

A Saudi order for 55 PC-21s was announced in May 2012, as part of a £1.6bn (US\$2.5bn) contract. The first three trainers for the RSAF departed Stans in June 2014 and the last three were delivered in March 2016.

Final batch of Iraqi T-50IQs delivered

A CEREMONY on November 29 marked delivery of the final pair of Iraqi Air Force Korea Aerospace Industries (KAI) T-50IQ aircraft, serials 5023 and 5024, completing the order for 24 of the type. All 24 (5001 to 5024) are assigned to the 204th Training Squadron and based at Basrah-Al Shaibah.

The contract for the

acquisition of 24 T-50IQs, valued in excess of US\$1.1bn, was signed between KAI and the Iraqi defence ministry in December 2013. KAI had originally stated that deliveries would commence in April 2015 and that all 24 aircraft would be supplied by April 2016. This schedule slipped, as the first T-50IQ

did not make its maiden flight until July 13, 2015.

All 24 aircraft had been manufactured by March 2017 and deliveries commenced with a first batch of six in February 2017. Six more followed in May 2018, another six arrived in October 2018 and four more were shipped in early May 2019.



One of the final two T-50IQs, serial 5023, at the delivery ceremony. IQAF via Dave Allport

More A330 MRTT and GlobalEye aircraft for United Arab Emirates

THE UNITED Arab Emirates (UAE) is expanding the fleets of A330 Multi-Role Tanker Transports (MRTT) and Saab GlobalEye Swing Role Surveillance Systems (SRSS) in service with the United Arab Emirates Air Force and Air Defence (UAEAF&AD). On November 19, during the Dubai Airshow, the service announced plans to acquire three more A330 MRTTs to join the three

that were delivered in 2013. The air arm is also set to buy two more GlobalEyes – three of these aircraft, based on the Bombardier Global 6000 business jet, are already on order.

The UAEAF&AD is in the closing stages of negotiating a contract amendment with Saab for a deal likely to be worth US\$1.018bn. The first two GlobalEyes were ordered at the Dubai Airshow

in 2015, with an order for a third being in 2017.

Emirati officials said that the release of the information for the MRTT purchase had been approved by the country's General Headquarters. Last May, Boeing confirmed that the UAE had issued a letter of request for three KC-46A tankers, but the latest move suggests a potential deal with the US firm is now off the table.

UAEAF&AD orders B-250

THE UNITED Arab Emirates' defence ministry awarded Abu Dhabi-based Calidus a US\$618m contract for 24 Bader-250 (B-250) light attack and advanced training aircraft during the Dubai Airshow on November 20. It's the first time the UAE has purchased a domestically produced military or civil aircraft.

Maj-Gen Pilot Abdullah Al Sayyed Al Hashemi, assistant undersecretary of the defence ministry for support services, said the contract involves spare parts and support: "To bring onboard an aircraft that is built in the UAE is very significant not just for the ministry of defence but for the whole of the UAE, because it improves the defence industry business in the country. It shows that we are improving and going in the right direction as part of the strategic plan of the UAE." He added that most of the weapons and ammunition to be used for the B-250 will also be made in the UAE.

In Brief

■ UAE set to buy CH-47Fs

The United Arab Emirates has been cleared to receive ten CH-47Fs and related equipment for US\$830.3m, after the US State Department announced approval for a follow-on procurement on November 7. The package also includes defensive weapon systems and countermeasures, radar warning receivers, MX-15Hdi electro-optical/infrared sensors, fast-roping gear, extended-range fuel tanks, ballistic protection and firefighting equipment.

■ No F-35 sale to UAE – for now

Pentagon and US State Department officials have confirmed that there are currently no plans to sell F-35s to the United Arab Emirates, although the Lightning II did make a first appearance at November's Dubai Airshow. The UAE has harboured aspirations of acquiring the fighter since 2009 and USAF Vice Chief of Staff Gen Stephen Wilson had previously confirmed that discussions of a potential sale were under way at the 2017 Dubai Airshow.

Second SC-105 for Brazilian Air Force



Above: SC-105 FAB 6551 receives a water cannon salute as it arrives at Campo Grande on November 24. FAB via Dave Allport

THE FORÇA Aérea Brasileira (FAB, Brazilian Air Force) has taken delivery of a second SC-105 Amazonas (C295M) search and rescue (SAR) aircraft from Airbus. Following a handover ceremony in

Seville, Spain on November 14, SC-105 FAB 6551 (c/n 181) arrived at Base Aérea de Campo Grande on November 24 to join 2º/10º Grupo de Aviação, Esquadrão Pelicano. The new aircraft is the

second from an order of three placed by the FAB in July 2014 at a total cost of US\$215.1m. The first aircraft was delivered in August 2017 and the final example is scheduled to arrive in 2020.

The latest aircraft is the first equipped with an in-flight refuelling probe. It also has Airbus's Fully Integrated Tactical System, Elta ELM-2022A maritime radar and Thales TopDeck avionics.

Paraguay receives Bell 407 from Taiwan

UNDER A bilateral co-operation agreement between the governments of Taiwan and Paraguay, a first Bell 407GX utility helicopter (c/n 54834) was donated to the Fuerza Aérea Paraguaya (FAP, Paraguayan Air Force) on November 1.

The helicopter will be used for VIP missions with the Grupo Aéreo de Helicópteros, stationed at Campo Grande/Ñu Guazú air base in Asunción. The new-build helicopter was formerly on the US civil register as N861KD and has taken up the FAP serial H-0402; it will join Bell 427 serial H-0401 also gifted by Taiwan, in November 2010.

The bilateral agreement also previously provided Paraguay with 13 UH-1s, the most recent of which were received last August – see *Paraguay receives more helicopters from Taiwan*, August 2019, p22. Three more former Republic of China Army UH-1Hs were being prepared for delivery in November.



Alejandro Hernández León

A RECENT addition to the Fuerza Aérea Paraguaya (FAP, Paraguayan Air Force) inventory is Cessna 680 Sovereign FAP 3001 (c/n 680-0272), seen at Las Palmas de Gran Canaria

Airport in the Canary Islands on November 6. The VIP transport had flown there from Düsseldorf Airport, Germany where it had arrived on November 1. The aircraft retains the colours

it wore while serving with Emair Aviation of Turkey as TC-RED. The FAP has leased a series of presidential transport aircraft since the retirement of 707-321B 4001 (c/n 18957/472) in 2007.

C-390 Millennium in Malta

FORÇA AÉREA Brasileira (FAB, Brazilian Air Force) KC-390 FAB 2853 (c/n 39000004) of the 1º Grupo de Transporte de Tropa (1º GTT, 1st Troop Transport Group), arrives at Malta International Airport, Luqa for a fuel stop on November 14. The airlifter is the first example in FAB service – as part of Ala 2 (Wing 2) in Anápolis – and was accompanied by a Super Tucano. Both aircraft were en route to the Dubai Airshow that took place from November 17-21. During the course of the show, Embraer announced it was



Ruben Zammit

renaming the multi-mission medium airlifter as the C-390 Millennium, although the KC-390 designation remains in use for versions equipped as aerial refuelling tankers. Deliveries of the 28 FAB KC-390s on order started

last September and the type recently conducted its first countermeasures ejection trials. The three chaff and flare launches were carried out during two flights from Ala 3 at Canoas at the end of October.

Additional Pampa III delivered to Argentina

THE FUERZA Aérea Argentina (FAA, Argentine Air Force) received an additional IA-63 Pampa III from the Fábrica Argentina de Aviones (FAdeA, Argentine Aircraft Factory) in Córdoba. The delivery took place on November 19. The aircraft, serial A-704, is the fifth production Pampa III built by FAdeA and the third to be handed over in 2019. It is the second of a new batch of four on order, the first of which, A-703, was handed over last September 13 – see *First of new batch of Pampa IIIs delivered*, November 2019, p22. The third aircraft was also due for delivery before the end of 2019.

The new aircraft will join the previous four in service with the FAA's VI Brigada Aérea at Tandil and be used for protection of the northeastern border. **Dave Allport**

Guatemala takes delivery of Twin Otter

THE FUERZA Aérea Guatemalteca (FAG, Guatemalan Air Force) recently added a new production DHC-6 Twin Otter 400 to its inventory. The aircraft, serial 1730 (c/n 972, ex C-GLVA), was handed over on September 27 and arrived at Base Aérea La Aurora, Guatemala City on October 1 in full FAG markings.

The first Twin Otter in FAG service has joined the Escuadrón de Transporte at La Aurora. The order for this aircraft had not previously been announced. The only other recent additions to the FAG have been four Cessna 208B Grand Caravan EXs ordered in June 2018. **Dave Allport**

In Brief

■ Ecuadorian Air Force orders six H145Ms

The Ecuadorian Air Force has signed a contract with Airbus Helicopters for six H145M helicopters, together with training and support. The rotorcraft will be assigned to Ala de Combate

22 at Base Aérea Simon Bolívar, Guayaquil, replacing the three remaining Dhruvs that were withdrawn in 2015. The H145Ms will be tasked with transport, search and rescue, combat, medical evacuation, surveillance and security missions.

■ An-178 for Peruvian Police

Ukraine's SFTE SpetsTechnoExport has signed a contract to deliver an An-178 to the Ministry of Interior of the Republic of Peru. The twin-jet transport will be supplied to the National Police of

Peru, together with training, aftersales service and extended warranties. It will replace an An-32B currently flown by the police.

■ Chilean Navy buys two H125s

The Chilean Navy has ordered two H125s from Airbus

Helicopters as it moves towards planned acquisition of five aircraft to replace its current fleet of Bell 206 JetRangers (local designation SH-57) for liaison, utility and training. The deal is valued at US\$6.7m and deliveries are expected in late 2020.

New helicopters for Moroccan Gendarmerie

A BATCH of five second-hand EC145s has been delivered to the Gendarmerie Royale Marocaine (GRM, Royal Moroccan Gendarmerie). All were operated for the last 15 years by REGA, the Swiss Air-Rescue service. They departed REGA's base at Zurich Airport, Switzerland on November 19, making a fuel stopover in Spain before continuing to Rabat, Morocco, where they were due to arrive on November 21. All still wore REGA's distinctive red and white colour scheme, but their Swiss registrations were taped over with new Moroccan serials, while small Moroccan flags were applied to their fuselages and the GRM badge on the tail. They will have full Gendarmerie colours applied at Rabat.

The helicopters comprise CN-BZP (c/n 9029, ex



Above: All five of the second-hand EC145s acquired by the Royal Moroccan Gendarmerie depart in formation from REGA's base at Zurich Airport to begin their delivery flight. REGA

HB-ZRB), CN-BZQ (c/n 9032, ex HB-ZRC), CN-BZR (c/n 9033, ex HB-ZRD), CN-BZS (c/n 9041, ex HB-ZRE) and CN-BZT (c/n 9215, ex HB-ZRF). They will join two other Gendarmerie EC145s in service since 2010-11. They will be used for search

and rescue and emergency medical assistance.

In addition to these older helicopters, the GRM is also purchasing an unknown number of new production H125s. Two of them, CN-BZN/F-WWPF (c/n 8748) and CN-BZO/F-

WWPZ (c/n 8749), were seen test flying from the factory at Marseille-Marignane, France on November 22. They already wore the overall grey Gendarmerie colour scheme and were expected to be delivered before the year-end. **Dave Allport**

Uganda upgrades training capabilities

UGANDAN PRESIDENT Yoweri Museveni made an official visit to Gulu Air Base on November 5 for the passing-out ceremony of the latest class of 18 pilots and 20 technicians for the Uganda People's Defence Air Force (UPDAF).

As part of the ceremony, no fewer than seven L-39 trainers were on display – including all four newly acquired L-39ZA aircraft recently delivered from overhaul and modernisation at the OAZ repair plant in Odessa, Ukraine (see *Uganda expands and modernises L-39 fleet*, December 2019, p23).

The two new aircraft from the 2018 batch are AF 731 (c/n 633831) and AF 745 (c/n 734111) – ex-Bulgarian serials 831 and 111, respectively. The 2019 batch consisted of aircraft AF 718 (c/n 432834) and AF 729 (c/n 633827) – ex-Romanian serial 134 and ex-Bulgarian serial 827, respectively.

In addition to the L-39s, in 2017 the UPDAF acquired two brand new Cessna 172S Skyhawks. Both AF 265 (c/n 172S12018) and AF 267 (c/n 172S12019) were present at Gulu, the former taking part in the flight demonstration with L-39ZO AF 703 and L-39ZA AF 718. **Vladimir Trendafilovski**

Icarus-X set for East African customer



Above: H3 Solutions' Icarus-X at the Dubai Airshow. Alan Warnes

H3 SOLUTIONS based in Namur, Belgium, displayed its Cessna 208 Icarus-X at November's Dubai Airshow. The modified Cessna 208 – wearing an Irish registration and civilian colour scheme – can be fitted with four hardpoints for seven-tube rocket launchers carrying guided or unguided rockets. Ralph de Gier, H3 Solutions CEO told *AFM*: "We have integrated Thales FZ275 laser-guided rockets [LGRs] for our launch customer in East Africa," adding "we are free

to integrate any system for a customer as long as it stays out of ITAR [International Traffic in Arms Regulations]."

Other weapons options include FN Herstal machine gun pods and Nexter 20mm cannon as well as guided and unguided bombs. De Gier explained: "It's a fully integrated system so all the sensors work together, and the pilot and operator can use a Thales Avionics Scorpion clip-on helmet-mounted display for cueing and operating the weapons."

Test-firing of weapons will occur in the customer's country in March. De Gier said: "The customer wants to fully understand the aircraft's capabilities. The first one will be delivered before the end of 2019, another in mid-2020 and the third possibly by the end of 2020." De Gier continued: "The one in mid-2020 is expected to be fully armed; this capability is currently in the last phase of its development and we hope to present the aircraft at Farnborough next year." **Alan Warnes**

Bell 412EP delivered to Cameroon

AN ADDITIONAL second-hand Bell 412EP has entered Armée de l'Air du Cameroun (Cameroon Air Force) service. The helicopter, TJ-XRA (c/n 36408, ex N412GC, YV-0156, N5000J, C-FOEP), was built in 2006 and was cancelled from the US register on September 20 on transfer

to Cameroon. It was seen dismantled in the KLM Cargo area at Amsterdam-Schiphol Airport on October 1 while being delivered as air freight.

This was reportedly the second example acquired during 2019, one having also been delivered in May, although precise details

are unknown. Cameroon received its first two Bell 412EPs in February 2010, although one was lost in a fatal crash on November 22 of that year (see *Attrition*, February and April 2011). A replacement for this helicopter was delivered in 2015. **Dave Allport**

In Brief

■ AH-64Es for Morocco

The US State Department has approved a possible US\$4.25bn Foreign Military Sale to Morocco of 36 AH-64E attack helicopters and related equipment. The package includes 18 AN/APG-78 fire control radars, 551 AGM-114R Hellfire missiles, 588 Advanced Precision Kill Weapon System (APKWS) kits and 200 AIM-92H Stinger missiles.

■ New H125 for Lesotho

The Lesotho Defence Force has commissioned a new H125 from Airbus Helicopters into service, replacing the example that crashed on December 20, 2018, killing one person and injuring three others. The new rotorcraft, serial LDF-29, named *Thaba Bosiu* after a local mountain plateau, entered service at Mejametlana air base in Maseru on November 22. Another two H125s are also in service.

■ Cape Verde prepares for C212s

A pair of former Portuguese Air Force C212s were being readied for delivery to the Guarda Costeira de Cabo Verde (Cape Verde Coast Guard) in November. Acquired via the Portuguese Sevenair Group, the Aviocars comprise former Portuguese Air Force serials 16504 and 16509. The aircraft will replace a Do228 withdrawn from use in February 2014.

Ethiopia takes delivery of G 120TPs

GROB AIRCRAFT recently handed over six G 120TPs to the Ethiopian Air Force as part of an unannounced order for ten aircraft. The first two, pre-delivery serials ETH-01 and ETH-02, were noted being prepared for delivery at the factory in Mindelheim-Matties, Germany in July. It's believed they entered service around September.

The aircraft are now based at Dire Dawa International Airport with an unidentified squadron. It is not known when the remaining four aircraft are due for delivery. **Dave Allport**

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Russia delivers two MiG-29UBs to Mongolia

RUSSIA HAS donated a pair of two-seat MiG-29UBs to the Mongolian People's Air Force (MPAF) as part of a programme to provide military technical assistance to the country. Bort numbers '18 Red' and '50 Red'

were formally transferred to Mongolia during a ceremony at Nalayh air base, Ulaanbaatar district, on November 26. The jets had arrived at the base on November 15.

Both aircraft are surplus former Russian Aerospace

Forces examples and received a basic overhaul before delivery.

These are the first fighters to become operational with the MPAF for many years. The MiG-21s also originally supplied by Russia have not been

operational for decades. It's reported that further assistance from Russia will include provision of up to 16 ex-Russian single-seat MiG-29s in the near future, along with a small number of surplus Russian L-39 jet trainers. **Dave Allport**



Newly delivered MPAF MiG-29UB '50 Red' during the formal handover ceremony from Russia at Nalayh. Russian Embassy in Mongolia

Afghanistan to expand Cayuse Warrior fleet

MD HELICOPTERS is to supply the Afghan Air Force (AAF) with up to 12 more MD 530F Cayuse Warriors under a fourth delivery order issued against the existing five-year, US\$1.4bn indefinite delivery/indefinite quantity (IDIQ) contract. The firm fixed-price award for the additional light attack and armed reconnaissance helicopters was made through the US Army Contracting Command on behalf of the Multi-national Aviation Special Project Office (MASPO). The IDIQ contract covers an estimated 150 MD 530F and/or MD 530G helicopters, up to 54 of which are now under contract for different operators.

The manufacturer recently announced it had completed deliveries of the first batch of 30 MD 530Fs for Afghanistan under the initial delivery order, issued in September 2017. The last five rotorcraft were shipped from Mesa-Gateway Airport, Arizona, on board a 747 and reached Kandahar on October 27. The aircraft were reassembled and ready for active service in less than ten days. With this shipment, the number of Cayuse Warriors delivered to the AAF reached 60, although at least four have since been lost to attrition.

India retiring final MiG-27s

INDIA'S ERA of operating swing-wing fighters was due to come to a close on December 31, when the Indian Air Force (IAF) was scheduled to retire its last MiG-27ML UPG strike fighters. The final operating unit was No 29 Squadron 'Scorpions' at Jodhpur Air Force Station, part of South Western Air Command's 32 Wing.

A formal ceremony was to be held on the last day

of the year to mark formal retirement. Named the Bahadur in IAF service, the first MiG-27s were inducted in 1984 and since then have served with seven operational squadrons, in addition to combat training and tactics evaluation units.

A total of 165 MiG-27MLs were built for the IAF under licence in India by Hindustan Aeronautics Ltd (HAL) and, from 2004, 38 of the original aircraft were modernised

by HAL to MiG-27ML UPG (upgrade) standard. This improved combat effectiveness and included a service life extension. The last of the un-modernised MiG-27MLs were retired at Hasimara AFS in December 2017. In recent years, the IAF has faced increasing serviceability problems with the type, prompting the decision to also withdraw all the upgraded aircraft. **Dave Allport**

New look for JASDF Hercules

PHOTOGRAPHED ON the morning of November 25 at Gifu Air Base, Japan Air Self-Defense Force (JASDF) C-130E 45-1074 (c/n 382-5017, FMS 83-0002) was being pulled out between hangars

wearing a striking new two-tone grey colour scheme, with no squadron or unit markings. The aircraft was seen in 2018 in the standard two-tone green camouflage. The Hercules – which is

normally operated by 401 Hikotai at Komaki AB – had undergone overhaul with Kawasaki Heavy Industries while at Gifu. It's not known if the new paint scheme will be applied fleet-wide.



Duncan Monk

India approves aircraft purchases

INDIA'S DEFENCE Acquisition Council (DAC) approved several significant military programmes at a meeting on November 28. These included the purchase of six additional P-8I Poseidons, although this total has been reduced from previous plans for ten due to budget constraints. A contract should be finalised within two years. Eight of the type are already in Indian Navy service, with four more on order for delivery in 2020-21. The new acquisition will bring the fleet to 18.

The DAC also revalidated the Acceptance of Necessity for the procurement of two additional indigenously developed airborne early warning and control (AEW&C) aircraft. The mission system and sub-systems for these will be designed, developed and integrated onto the main platform by India's Defence Research and Development Organisation (DRDO) for delivery to the Indian Air Force. It's anticipated that the Airbus A330 will be used as the airframe for these new AEW&C platforms.

The DAC also approved planned acquisition by the Indian Coast Guard of 14 shore-based twin-engine heavy helicopters. These would undertake missions to prevent maritime terrorism, as well as search and rescue. Local sources indicate that the H225M and S-92 are primary contenders for the requirement. **Dave Allport**

Final Cygnus on delivery to South Korea



THE FOURTH and final KC-330 Cygnus (A330-200 Multi-Role Tanker Transport) for the Republic of Korea Air Force (ROKAF) departs the Airbus Defence and Space factory airfield at Getafe, Madrid, on November 26 for its delivery flight to Gimhae Air Base, South Korea, via Calgary, Canada. The aircraft, which will receive the ROKAF serial 19-004 once in service, was still marked as MRTT053 and used the callsign 'AED353'. The tanker-transport had returned to Getafe after being painted at Cambridge Airport in the UK in October. Airbus delivered the third ROKAF MRTT last August (see *Third ROKAF A330 MRTT prepares for delivery*, August 2019, p24).

Roberto Yáñez

In Brief

■ Fourth Philippine C295M delivered

The Philippine Air Force formally accepted its fourth C295M at Clark Air Base in Pampanga on November 11. The transport was acquired under the Command-and-Control Fixed-Wing Turboprop Acquisition (C2FWTPA) programme and will initially be used to deliver aid to earthquake-hit Mindanao. It will subsequently be employed for VIP and presidential transport.

■ Meteor missile for KF-X fighter

MBDA has been awarded a contract from Korea Aerospace Industries (KAI) to integrate its Meteor beyond-visual-range air-to-air missile onto the KF-X future fighter. The deal includes integration support to KAI, transfer of knowhow and manufacture of test equipment for the KF-X integration and trials campaign.

■ Bell 412EPI for Indonesia

PT Dirgantara Indonesia (PTDI) is fitting out two of the nine Bell 412EPIs destined for the Indonesian Army and ordered earlier in 2019. Bell Textron recently handed over one of these to the PTDI facilities in Bandung – it was the 70th helicopter transferred by the American company to PTDI.

■ New aircraft for Nepal

The Nepalese Army has taken delivery of the single CN235-220 produced by PT Dirgantara Indonesia (see *Nepalese CN235 ready for delivery*, October 2019, p25). The transport – serial NA-062 (c/n N068) – was delivered to Nepal last November 2 and officially handed over later that month. Other new aircraft recently noted in Nepalese Army service include the second AW139 (9N-RAM, c/n 31860) received in September and two Piper PA-28-181 Archer IIIs delivered in February 2019 (NA-059, c/n 2843938 and NA-060 c/n 2843939).

■ Philippine Cobras arrive

Two AH-1 attack helicopters donated to the Philippines by Jordan have arrived in the country, according to local reports. The Cobras are said to have been transported to Clark Air Base aboard an An-124 cargo aircraft on November 26. After assembly and flight tests they were expected to enter service in December.

Tiger stripes for ROKAF's 111th Fighter Squadron



Stefan Goossens/4Aviation

DURING A recent visit to South Korea it appeared that the Republic of Korea Air Force's (ROKAF's) 111th

Fighter Squadron (FS) 'Tigers' has started applying a tiger-striped tail fin. At least two different KF-16C Block

52s from the unit were seen wearing the markings. The 111st FS operates the KF-16s from Gunsan Air Base where

it is assigned to the 38th Fighter Group, which itself is subordinate to the 10th Fighter Wing at Suwon AB.

Second Thai Army C295W delivered



ROYAL THAI Army C295W 19160 (c/n 160) passed through Malta International Airport, Luqa, during its delivery flight

on November 26, using the callsign 'AED960'. This is the operator's second C295W, following serial 16150 (c/n 150),

which entered service in August 2016. The latest aircraft, which was first seen pre-delivery at Seville, Spain, last April, arrived

Ruben Zammit

in Bangkok on December 2. It has been assigned to the Army Transportation Department stationed at Don Muang Air Base.

Contract for 15 more RAAF Lightning IIs

LOCKHEED MARTIN has been awarded a contract for production and delivery of a further 15 Royal Australian Air Force (RAAF) F-35As. The US\$831m deal, awarded to the manufacturer by US Naval Air Systems Command on November 26, covers the 15 Lot 14 Lightning IIs along with associated equipment. Contract completion is anticipated in March 2023. An earlier agreement covering long-lead components for this batch had been awarded on April 1, 2019.

The latest contract brings RAAF production orders to 63 out of a planned procurement of 72; 18 have been delivered to date. **Dave Allport**

Australia chooses MQ-9B

THE AUSTRALIAN Department of Defence (DoD) announced on November 28 that it had down-selected the General Atomics Aeronautical Systems Inc (GA-ASI) MQ-9B Sky Guardian for its Project Air 7003 requirement for an armed remotely piloted aircraft system (RPAS), rather than the same company's MQ-9A Reaper. The next phase in the AUS\$1.3bn (US\$880m) programme will focus on developing the MQ-9B acquisition proposal, which is scheduled for government consideration in 2021-22.

Canberra is expected to acquire 12-16 MQ-9Bs for the Royal Australian Air Force (RAAF), to replace the unarmed Israel Aerospace Industries (IAI) Heron 1 RPAS, which was retired in August 2017.

The DoD announced selection of the MQ-9 in November 2018, in favour of the IAI Heron TP. The Project Air 7003 Phase 1 requirement was identified in the Defence White Paper of February 2016. This called for an armed RPAS to provide "enhanced firepower and intelligence, surveillance and reconnaissance support".

Last three RAAF PC-21s delivered



Above: The last PC-21 for the RAAF, A54-049/HB-HWW prepares to leave Stans for the ferry flight to Australia. *Stephan Widmer*

PILATUS AIRCRAFT has completed delivery of all 49 Royal Australian Air Force (RAAF) PC-21s. The final three aircraft – A54-047/HB-HWU (c/n 280), A54-048/HB-HWV (c/n 281) and A54-049/HB-HWW (c/n 282) – left the factory at Stans-

Buochs, Switzerland on November 15, initially flying to Bari, Italy. After various intermediate stops, they arrived in Darwin, Northern Territory, on November 23. The next day they continued to Adelaide Airport, South Australia via Alice Springs,

Northern Territory. After a further night stop, on November 25, they flew the last leg of their delivery flight to RAAF Base East Sale, Victoria, where formal acceptance has taken place for each aircraft before going on to their operating unit.

These final three were in the overall grey colour scheme and wore the tail markings of No 4 Squadron at RAAF Base Williamstown, New South Wales, which will fly them in the forward air controller training role. **Dave Allport**

Latest RAAF P-8A under test



THE NEXT Royal Australian Air Force (RAAF) P-8A returns to Seattle's Boeing Field facility in Washington on November 13, following a flight test. Serial A47-012 (c/n 64168, line number 7603)

is the twelfth Poseidon for the air force. The previous aircraft, A47-011 (c/n 64167, line number 7427), was delivered to RAAF Base Edinburgh, South Australia on October 4 and is now in service with

the resident No 11 Squadron. Purchase of an additional three Poseidons is planned, as announced in the Defence White Paper on February 26, 2016, but no contract has yet been awarded.

RAAF P-8A ends Middle East mission



Above: RAAF P-8A A47-006 at Al Minhad AB – the ADF's main operating base in the Middle East region. *LSIS Craig Walton/Commonwealth of Australia*

A ROYAL Australian Air Force (RAAF) P-8A has completed its first operational deployment to the Middle East. The Australian Department of Defence announced the return of the Poseidon from Al Minhad Air Base in the United Arab Emirates on November 25.

The deployment was part of Australia's contribution to the International Maritime

Security Construct (IMSC). In a statement, Minister for Defence Senator Linda Reynolds said: "Over the last month, the P-8A Poseidon aircraft has provided valuable maritime surveillance and reconnaissance to support the coalition partners in the IMSC." Reynolds added that the aircraft had "played a key role in supporting freedom of navigation and

the free flow of shipping, which is crucial to regional security and stability".

The P-8A had arrived at Al Minhad AB on October 15 and was deployed for a month within the Australian Defence Force's (ADF's) Air Task Group, under Operation Accordion. The RAAF previously deployed AP-3C Orions to the region between 2003 and 2012.

In Brief

■ C-130J approved for New Zealand

The US State Department has approved a possible Foreign Military Sale to New Zealand of five C-130J aircraft and related equipment for an estimated cost of US\$1.4bn. The US Defense Security Cooperation Agency delivered the notification to Congress on November 20. The outlined package includes 13 AN/AAQ-24(V)N Large Aircraft Infrared Countermeasures (LAIRCM) systems, eight AN/AAR-47 missile warning systems, 15 AN/ALE-47 countermeasures dispensing systems and six MX-20HD electro-optical/infrared imaging systems.

■ Poseidon base work begins in New Zealand

The New Zealand Ministry of Defence announced that infrastructure works for the new P-8A fleet began at RNZAF Base Ohakea on November 29. The four-strong Poseidon fleet will be stationed there and operated by No 5 Squadron, Royal New Zealand Air Force. The first aircraft is expected to arrive in 2023 to replace the P-3K2 Orion. The project's infrastructure includes crew and maintenance simulators, an operations centre and hangar, warehousing and maintenance facilities.

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Geoff Garbett and his RAF Association befriender, Sgt Seth Andrews, at Geoff's home in Ipswich.



Former Chief Technician Geoff Garbett left the RAF after 28 years' service, and settled in Ipswich with his wife, Margaret.

Geoff and Margaret enjoyed decades of happy retirement together, but a few years ago Margaret was diagnosed with dementia. Geoff became her carer, and soon realised he needed support.

Geoff said: "I first learned of the RAF Association's befriending service after reading an article in the charity's magazine, Air Mail. Because of Margaret's condition, I felt I could do with some support, so I asked them

if I could meet a befriender."

Sgt Seth Andrews became a befriender after receiving training from the RAF Association. He was introduced to Geoff before Christmas 2017, and they connected immediately.

Seth said: "The befriending scheme had always interested me, precisely because it would mean helping veterans like Geoff. We met up and went for coffee in Ipswich, and our shared interest in the RAF meant we were instantly on the same wavelength.

"The dementia awareness training I received as part of my befriender

course meant I was able to understand what Margaret and Geoff were going through."

Sadly, Margaret died in 2019, leaving Geoff even more isolated. Seth began meeting him more often, and encouraged him to keep active in the community through joining local clubs and taking up swimming again.

Geoff said: "Seth's been brilliant, he's been helping me to keep busy. We plan to visit Duxford airfield together soon. I was stationed there for a while nearly 40 years ago, and I look forward to seeing how it's changed, and telling Seth about my time there."



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Airbus o



The media event in early November was a chance to catch up with senior management and receive updates on many of the company's military programmes. Although the focus was the German division – Airbus Helicopters at Donauwörth and Airbus Defence and Space at Manching – several key players from the company's Madrid branch discussed recent developments in their airlifter (C295 and A400M) and tanker (A330 MRTT) businesses. As well as the Donauwörth and Manching facilities, media representatives also went to nearby Neuburg air base to visit the Eurofighter-equipped Taktisches Luftwaffengeschwader 74 (TaktLwG 74).

Germany to take Eurofighter lead

Many of the major talking points at Manching surrounded the Eurofighter, thanks to Kurt Rossner, head of the company's Combat Aircraft Systems portfolio. He said: "A few years ago, the UK was the leading nation for Eurofighter development. We saw it in most of the creativity, usage and [plans for the] future. This was all with a view to ensuring the RAF's Typhoon Force took over from the Tornado [under Project Centurion] by the end of 2018, and this drove the aircraft's evolution over the past four years."

Rossner said Germany was now taking over as Eurofighter 'lead', with Spain following closely: "We

need to ensure that the German Tornado can be replaced, meaning the integration of new capabilities on the Eurofighter with a new E-Scan [active electronically scanned array] radar." As part of its Project Odin capability roadmap, Germany has integrated the laser and GPS-guided GBU-48 Paveway II – see *Into the fighter-bomber business*, p50-54. Rossner now believes other countries could follow the RAF's lead by integrating the MBDA Brimstone, Meteor beyond-visual-range air-to-air missile (BVRAAM) and Storm Shadow cruise missile.

Germany is set to upgrade 110 Tranche 2/3 aircraft with the E-Scan Mk1 radar under its early embodiment programme, from the

second quarter of 2022, and Spain would then follow with 19 Tranche 3s from Q3/2022. The retrofits pave the way for the aircraft's Long Term Evolution (LTE) that will support export campaigns as well as the development of enhanced electronic warfare capabilities and the Future Combat Air System (FCAS).

Rossner explained: "We are working with Germany to deliver the [E-Scan Mk1] capability; the contract is ready and we hope it will be signed off by the end of 2019 or early 2020. We will start that programme first before embarking upon Project Quadriga."

He revealed that Quadriga will cover the production of 38 new German aircraft, comprising

pens up

After a gap of three years, Airbus held its three-day Trade Media Briefing for military aviation journalists from all over the world. **Alan Warnes** reports from Bavaria.



Above: Luftwaffe Eurofighter 31+41 from TaktLwG 31 'Boelcke' flying over the Manching runway at a speed of Mach 0.9 and altitude of 200ft. The future for the jet in Germany looks bright, with plans to upgrade 110 existing Tranche 2/3 aircraft with Captor-E radar before acquiring 38 new Tranche 3 examples, comprising seven twin-seaters and 26 single-seaters, plus options for a further five single-seaters. Dietmar Fenners **Below:** Kurt Rossner, chief of the Airbus Defence and Space's Combat Aircraft Systems division speaks at the Trade Media Briefing. Airbus

seven twin-seaters and 26 single-seaters – plus options for a further five single-seaters – to replace the high-hour Tranche 1s. These older, less capable, jets will undoubtedly go through a similar TyTAN (Typhoon Total Availability eNterprise) programme as the RAF – where all parts are reclaimed and fed into new aircraft. Rossner continued: “The Quadriga Typhoons will also include an E-Scan radar with a multichannel receiver. We aim for contract award – which also includes attrition replacements for the two German Air Force jets lost in July – in early 2020. I’m sure they will be available in the German fleet by around 2024.”

With Germany set to replace

its Tornados by 2030, there’s also a requirement for 85 more aircraft, split into two batches. This includes 45 with strategic (nuclear) capabilities and 40 with an escort jammer capability. While Rossner said that the Eurofighter is capable of replacing the Tornado in *all* missions, it’s not currently wired for the nuclear role, unlike its rival in the bid, the F/A-18E/F Super Hornet.

Like the RAF, all the Luftwaffe’s Tornado requirements have to be integrated into the Eurofighter, and this in turn will become part of the LTE development cycle. Rossner believes it will bring huge advantages to Eurofighter’s export prospects. He said: “We are the lead nation and industry

lead for Switzerland, which is looking to replace F/A-18 Hornets and F-5 Tigers, which will allow a neighbouring country to join us in our capability roadmap. We can deliver their needs with our product, which is ideal for air policing, and Eurofighter offers full autonomy in mission and technology access for Switzerland.”

The production line at Manching is currently halted, now that all 151 German Eurofighters have been built (see *Final Luftwaffe Eurofighter... for now*, December 2019, p12). The Quadriga aircraft – with options for conformal fuel tanks (like the RAF), an aerodynamic kit and improved head-up display – would be next to come off the line, at a rate of eight to ten aircraft per year, ▶





The Eurofighter's Captor-E active electronically scanned array radar will become the future primary sensor on the Typhoon. According to the manufacturer, the capacious aperture on the jet allows installation of the repositionable array, with a field of regard around 50% wider than traditional fixed-plate systems. Eurofighter

although this could be increased if Airbus is successful in Switzerland. With Centurion being followed by Quadriga, Rossner is confident Eurofighter can act as an enabler for the FCAS too. He added: "We can do this by improving mission capability in different roles, weapons, sensors, interoperability, range persistence, technical training, mission support and the cockpit."

E-Scan radars

There's a common standard of AESA radar emerging via the baseline development programme, and then there are potential national requirements. The results can be confusing! The common Captor-E is the current four-nation

development programme – this has been procured by Kuwait and Qatar and will be installed on some German Quadriga aircraft. Captor-E is also sometimes referred to by Leonardo as Radar 1+ and Radar Mk0. Radar Mk1 (Germany) and Mk2 (UK) are Leonardo names for national development work and do not necessarily reflect the final outcome, which could be a common future radar standard.

Leonardo would not reveal what the national developments are at this stage. However, the UK option includes integrated electronic warfare capabilities in line with the RAF's F-35Bs. According to Rossner, Germany is "discussing parallel activities

between its air-to-air and air-to-ground needs with a modular adopted electronic warfare suite".

The first E-Scan radars for Eurofighters are bound for Kuwait, the initial export customer, with delivery expected in April 2020.

During demonstrations to the Swiss Air Force, the Eurofighter was the only candidate without an AESA. On this matter, Rossner said: "That's true, but if contract discussions commence, we will demonstrate an E-Scan aircraft prototype to the Swiss Air Force."

A400M

Alberto Gutiérrez, previously CEO of Eurofighter GmbH and head of Airbus Combat Air Systems, is now chief of Airbus' Military Aircraft division. He assumed control last January from Fernando Alonso, who spent much of his time steering the business through choppy waters following the crash of an A400M during flight-testing on May 9, 2015.

Gutiérrez admitted that 2019 had been a crucial year for the Military Aircraft division and the A400M programme was finally being stabilised. By mid-October there were 174 orders – a number unchanged since the

2015 accident – with 84 delivered.

A Reuters report on November 13 stated that Germany had refused to accept two more A400Ms, citing recurring technical issues. Airbus responded: "We are aware of findings related to dowel bolts/propeller interface in some of our customer aircraft. This is not safety critical and our customers continue to accept and operate their aircraft."

After issues with the side doors that restricted paratrooper jumps, Gutiérrez was pleased to report that 40 paratroopers had now exited simultaneously from both sides using the aerial delivery static-line, and 58 had departed from one side. These milestones conclude the certification test phase of the A400M's paratrooper dispatch capability, pending the completion of certification activities in the first half of 2020. The trials pave the way for the simultaneous deployment of 116 paratroopers, 58 from each side – a joint military requirement for certification of mixed operations.

Eric Isorce, from the company's Flight Test & Operations department, told *AFM* these successes were due mainly to introduction of a much-modified side door, allowing paratroopers to jump with a clearance of more than 60cm (27in) from the side of the fuselage.

Gutiérrez added that the A400M's air-to-air refuelling (AAR) issues with helicopters had now been resolved: "H225M and H160M helicopters went through dry contacts with an A400M in September and now we are set for the wet contacts."

Initial helicopter AAR tests back in 2015 showed there was excess turbulence from the wake of the

A400M status, October 2019

Nation	Ordered	Delivered
Belgium and Luxembourg	8	0
France	50	15
Germany	53	31
Malaysia	4	4
Spain	27	5
Turkey	10	9
UK	22	20
Total	174	84

"A split in Europe will mean the two divisions will be too small to be on a competitive scale with China and the USA. We believe we can be on an eye-to-eye level with these two nations." Dirk Hoke

An artist's impression of the two-seat Eurofighter ECR, expected to be available by 2026, followed by further development steps and full integration into the FCAS 'system of systems'. The aircraft will be able to provide passive emitter location as well as active jamming of threats, and will offer a variety of modular configurations for electronic attack and suppression/destruction of enemy air defences. Airbus



A400M, as well as concern over the distance of the H225M's rotors from the refueller. The solution saw the length of the hose increased from 80ft (24m) to 120ft (36m) and made thinner. Isorce added: "After the trial, the French H225M test pilot said there were no problems with the rotors, no difficulties in approach and sufficient margin to stay in the basket. Wet contact demonstrations for the H225M AAR certification will start in December and continue in the first quarter of 2020 and on to 2021."

While the new H160M helicopter (see boxed item) has flown two dry contact sorties as part of a risk-reduction exercise, *AFM* was told there will be no move towards a wet contact unless the French defence ministry decides that AAR will be an H160M requirement. The French armed forces are to procure 169 H160Ms as part of the Hélicoptère Interarmées Léger (Joint Light Helicopter) programme, which will replace older rotary fleets across all three services.

The A400M has also added to its AAR capability (see last month's Intel Report) by introducing two Cobham Mk908E hose-and-drogue pods under each wing – to offload up to 51 tonnes of fuel to receivers. With the addition of a Cobham Mk808E hose drum unit, another ten tonnes could be added if required, and it would also allow the airlifter to refuel three helicopters at once. According to an Airbus spokesman: "All the A400M customers want AAR capabilities except for the RAF."

Last July, Germany deployed an A400M to Jordan in the AAR role with two pods, to refuel two Tornados simultaneously.

Hoke: Europe's FCAS projects must merge

Currently, there are two Future Combat Air System options in Europe. France, Germany and Spain have their own Next Generation Fighter (NGF) while the UK – with Sweden and Italy as potential partners – is pursuing Tempest. Dirk Hoke, Airbus Defence and Space CEO, is part of the first solution and had some fairly robust views on the competition between the two sides. He said: "We cannot fall behind the US and China, we [in Europe] need to get our act together for a common approach, not a national approach. A split in Europe will mean the two divisions will be too small to be on a competitive scale with China and the USA. We believe we can be on an eye-to-eye level with these two nations."

"I believe both FCAS sides in Europe need to make compromises; in the end we will all benefit if we find a European solution on how we approach defence. Fragmenting the topic would be a major step backwards. If we end up with two different major defence projects that

compete for the nations' involvement and all the supply chains, it would be similarly negative to when Rafale took on Eurofighter. Once we know how Brexit materialises a door could open, allowing

us a discussion on a new way forward – to merge the two projects. It would be beneficial for nations to work together and this is the vision we should follow. There has to be a common approach."



In early 2019, France and Germany awarded a first FCAS contract – a two-year Joint Concept Study – to Airbus and Dassault Aviation. By the middle of the year, the two companies had delivered a joint industrial proposal to the French and German governments for FCAS's first Demonstrator Phase – this full-scale model of the NGF and remote carriers was revealed at the Paris Air Show last June. Airbus

New C295s

While the A400M is emerging from tough times, the C295 has never had to weather such storms. Delivery to Canada of the first of 16 CC-295s for the Fixed-Wing Search and Rescue (FWSAR) role is imminent, following the aircraft's first flight last July 4. According to Ioannis Papachristofilou, Airbus Defence and Space's vice-president, head of marketing, the CC-295s for Canada have been completed to a revised standard: "In addition to the winglets [which are now a regular feature on the C295W], the aircraft has streamlined exterior lighting, vortex generators on the rear ramp and an internal HF antenna close to the top of tail, but the most

obvious change is the closed-up [fully faired] main landing gear."

The cockpit houses Collins Aerospace Pro Line Fusion avionics to "provide more extensive situational awareness", according to an Airbus spokesperson. The European company's Fully Integrated Tactical System (FITS) accommodates a SATCOM, L3 Wescam MX-15HD electro-optical/infrared (EO/IR) sensor and Elta's proven EL/M 2022 maritime surveillance radar. All this information is fed into the two FITS consoles in the rear.

The 16 aircraft will operate from Canadian Forces Base Comox, British Columbia (five CC-295s for 418 Search and Rescue Operational

Training Squadron); CFB Winnipeg, Manitoba (three CC-295s for 435 Transport and Rescue Squadron); CFB Greenwood, Nova Scotia (three CC-295s for 413 Transport and Rescue Squadron); and CFB Trenton (three CC-295s for 424 Transport and Rescue Squadron); two additional aircraft will be used as 'floaters' when other aircraft are undergoing maintenance.

Gutiérrez said this variant "should enable future success in the MSA [maritime surveillance aircraft] and MPA [maritime patrol aircraft] arena". Two other customers to have ordered the latest FITS are Brazil (for its SC-105s) and another that Airbus wouldn't name due to contract restrictions. This is likely ▶



Last September, an A400M achieved its first helicopter air-to-air refuelling contacts with an H225M. Over the course of four flights, operated in day conditions over the south of France, the tanker performed 51 dry contacts involving no fuel and performed between 1,000ft and 10,000ft at flight speeds as low as 105kts. DGA Essais en vol

the Saudi Presidency of State Security (PSS) which ordered four C295s in 2015. Gutiérrez added that he was optimistic over the much-delayed Indian order for 58 C295s to replace ageing HAL 748s, in a deal reputedly worth US\$1.7bn. Airbus is in partnership with Tata Advanced Systems in India and, according to Dirk Hoke, CEO Airbus Defence and Space, any Indian Air Force contract "would see 16 built in Europe and 40 in India, but we see a potential market in India for 150 C295s."

Gunship C295s

A gunship is part of a family of C295 options, according to Papachristofilou, who told *AFM*: "We have delivered C295s with two pintle-mounted machine guns which meets the needs of that customer." While he wouldn't name the client, the United Arab Emirates (UAE) ordered five C295s at the 2017 Dubai Airshow, where a demonstrator aircraft appeared in a light-attack configuration. At the time, an Airbus spokesman told *AFM*: "Weapons integration on the prototype is expected by October 2018, with a first aircraft operational two-and-a-half years later in mid-2021."

A United Arab Emirates Air Force and Air Defence (UAEAF&AD) C295 did appear at the 2019 Dubai Airshow, with an EO/IR turret but no machine guns. Beyond the baseline C295 attack configuration there are other options, Papachristofilou



Above: Part of the static display at the 2019 Dubai Airshow was this UAE Air Force and Air Defence C295. The UAE is a likely candidate for an initial gunship version of the C295, with two pintle-mounted machine guns. The Gulf state ordered five C295s at the 2017 Dubai Airshow. Airbus Left: The first CC-295 - purchased for the Royal Canadian Air Force's Fixed-Wing Search and Rescue (FWSAR) aircraft replacement programme - rolled out of the paint shop at the Airbus facility in Seville, Spain. The aircraft will now go through the final preparation phase before its delivery to the customer, planned to take place in Spain before the end of 2019. Airbus

confirmed: "We have put a Mauser 27mm gun in the back, but it will require a targeting system with an EO/IR turret and a console to operate it. A third option is to add laser-guided rockets and Hellfire-type missiles, depending on the customers' stocks of weaponry. We are planning to do a trial in the near future to see the aircraft flying with weapons and showing the variations to possible clients."

A330 MRTT

The A330 Multi-Role Tanker Transport (MRTT) has now flown more than 200,000 flight hours since entering service in 2014 and serves seven countries - Australia, the

UK, UAE, Saudi Arabia, Singapore, France and South Korea. In 2020 it will join NATO's Multinational MRTT Force (MMF) - see last month's issue of *AFM*. Of the 60 aircraft on order, there have been 41 deliveries. The 19 outstanding orders comprise ten for France, eight for the MMF and the final South Korean example. At the recent Dubai Airshow, the UAEAF&AD announced a requirement for three more A330 MRTTs, and contract negotiations will undoubtedly start soon (see Middle East, p21).

In June 2018, the Royal Australian Air Force (RAAF) and Airbus performed the world's first automatic AAR contact with a large

aircraft receiver - a KC-30A. This follows the first automated boom contact, with an F-16, on March 2, 2017. The next step, according to Papachristofilou, is to improve the system's safety and reliability.

One of the biggest achievements in 2019 was updating the F-15 boom control laws, aimed at improving operations with the Eagle. Even though the F-15 was certified to refuel from an MRTT in 2013, it hasn't all been plain sailing since. Papachristofilou said: "It was important, beyond certification, to improve the operation and reduce the boomer's workload, so we set about improving the control law." Certified in 2018 and available from early 2019, it appears the F-15 operator tasked to do the work was the Royal Saudi Air Force, although other A330 MRTT/F-15 operators - the Republic of Korea Air Force and Republic of Singapore Air Force - were also involved in the improvement.

The RAF Voyager force currently faces a real quandary because the eagerly awaited E-7 Wedgetail airborne early warning and control (AEW&C) platform and Poseidon MRA1 maritime patrol aircraft (MPA) both require a boom-equipped refueller. The RAF/Air Tanker Voyagers only have the hose-and-drogue system. It was previously reported that it would be very difficult and expensive to upgrade the aircraft. However, Papachristofilou added: "It's the customer's decision; today the aircraft are equipped with an FRU [fuselage refuelling unit] so the options are to upgrade with a boom or buy new aircraft. We can retrofit a boom onto existing aircraft." **AFM**

H160M

Airbus Helicopters' military H160M programme will be launched in 2021, with a prototype making its first flight in 2023 and deliveries beginning in 2026. The first examples will go to the French Army, followed by the French Navy in 2028 and then the French Air Force. The army is set to receive 80 examples, the navy 49 and the air force 40.

Certification of the 1,280shp (941kW) Safran Arrano engine was completed last June. Further developments have included modifications to the airframe and addition of new Thales FlytX avionics.

Under the nose of the mock-up on display at Donauwörth was a Safran Euroflir 410 and a Thales three-podded tactical radar. The naval version will

have folding rotor blades and reinforced landing gear. Armament will include the MBDA Sea Venom anti-ship missile and the HForce kit with 12.7mm calibre machine guns and capacity for laser-guided rockets and 20mm cannon.

Cabin-mounted armament could include a pintle-mounted 7.62mm calibre machine gun or sniper rifle.



A mock-up of the H160M displayed at the recent Trade Media Briefing. Last May, the French Ministry of the Armed Forces brought forward development of the future Joint Light Helicopter to 2021. Launching the programme earlier will enable delivery of the first H160Ms to the French military to be advanced to 2026. Airbus

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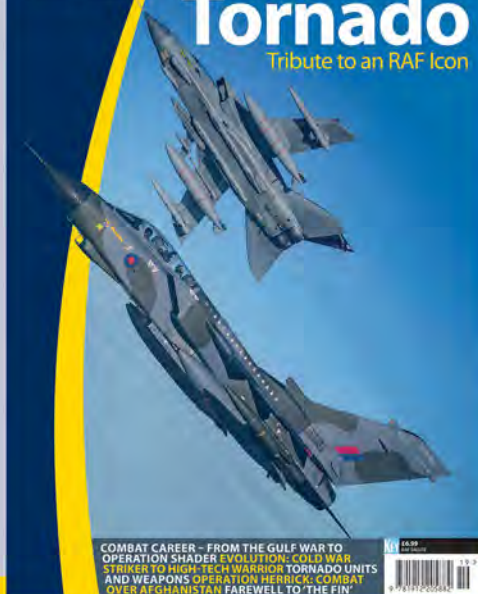


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Big broth

Güvercinlik air base near the Turkish capital, Ankara, is home to the heavy-lifters of the Turkish Land Forces. The Turkish Chinooks are an entirely different class of rotorcraft to the other light and medium transport/utility helicopters in the army aviation's inventory. **Onur Kurç** and **Tayfun Yaşar** joined them on exercise.

The Kara Kuvvetleri Komutanlığı (Turkish Land Forces) have amassed plenty of experience in helicopter-based airmobile operations. Rotary-wing units have demonstrated their importance during recent cross-border security operations such as Euphrates Shield and Olive Branch in Syria. Here, typical missions have included delivering special forces troops into hard-to-reach mountainous areas and behind enemy lines. Helicopters of the Kara Havacılık Komutanlığı (Turkish Army Aviation Command) routinely perform key tasks including transport of land units, materiel and other assets in the southeast border regions that are dominated by mountains and difficult geographical conditions. Turkish Army Aviation began to seek a

heavy transport helicopter capability back in the early 1990s. Since then, the importance of air transportation and rotary operations – especially in the fight against terrorism and in internal security work – has only increased. The value of a heavy-lift helicopter in a country featuring so much rugged terrain was clear but, initially at least, no such type was purchased, due to a combination of political unrest, various economic crises and international rifts. Despite this, by 2006, various manufacturers had been approached, tenders opened and quotations received. At that point, a purchase of secondhand US military helicopters was looking the most likely option, but such a sale failed to gain approval from the US Congress. Finally, on June 30, 2006, Turkey's Defence



ers

Industry Executive Committee made a first concrete step towards providing a heavy-lift helicopter to meet the needs of the Turkish Land Forces. Price proposals were requested for the Boeing CH-47 Chinook and Sikorsky CH-53K King Stallion. As a result of these studies, it was decided to purchase the Chinook under the Foreign Military Sales (FMS) programme. US Congress provided approval for the sale in December 2009 and negotiations with Boeing began. The approved package included up to 14 CH-47Fs, 32 T55-GA-714A turbine engines, 28 AN/ARC-201E Single Channel Ground and Airborne Radio Systems (SINCGARS), 14 AN/APR-39A(V)1 radar warning receiver sets, plus support equipment, personnel training and related equipment, ferry

services, etc. The estimated cost was US\$1.2bn.

In August 2011, the Turkish media reported that a government-to-government deal had been reached late the previous month to buy six CH-47Fs. After further negotiations, the purchase of five more Chinooks was approved by the Defence Industry Executive Committee on January 7, 2015, and a contract was signed in September. Under these plans, it was initially decided that six of the helicopters would be delivered to the Turkish Land Forces, four to the Special Forces Command and one to the Ministry of National Defence for use as a VIP transport.

Strategic location

Assessing strategic and logistics considerations,

an evaluation was made to determine the optimum base to house the new Chinooks. In the end, the choice fell upon the Army Aviation Command's Güvercinlik air base near Ankara. Since the CH-47F is of a different class to the other light and medium transport/utility helicopters in the army's fleet, a maintenance unit and helicopter battalion were created to maintain and operate the aircraft. The six CH-47Fs were assigned to a new unit: the 3'üncü Bölük (3rd Company) of the 1'inci Helikopter Taburu (1st Helicopter Battalion). This falls under the jurisdiction of the 1'nci Kara Havacılık Alay (1st Army Aviation Regiment) at Güvercinlik.

The first three helicopters to be introduced to the Turkish Land Forces arrived in a disassembled condition at the port of İzmir on ▶



Above: The loadmaster looks on from the fuselage door as 16-7461 (c/n M7461) perches atop a narrow ridgeline. Initial in-country training activities were supported by a US Army Technical Assistance Field Team. **Top:** The advanced flight deck of the CH-47F. The 'Foxtrot' version of the venerable Chinook boasts a fully integrated digital cockpit management system and Common Avionics Architecture System (CAAS) cockpit. All photos Onur Kurç and Tayfun Yaşar

Turkish Army Aviation Chinooks

July 14, 2016; the other three arrived in November. After reassembly, the helicopters were flown from Izmir to Güvercinlik. In August 2018, it was decided that the single helicopter ordered for the Ministry of National Defence would instead be operated by the Turkish Army Aviation Command and this too joined the inventory.

The four CH-47Fs ordered for the Special Forces Command were delivered to Izmir on July 31, 2019. Unlike the standard army helicopters, these Chinooks feature provision for fast-roping from the hatch below the fuselage.

Crew complement

The CH-47Fs operated by Turkish Army Aviation Command are flown by a crew of five: two pilots, two technicians and a loadmaster. A normal load comprises 33 troops, but up to 55 soldiers can be accommodated if required. If necessary, the helicopter can also be transformed into a flying hospital with provision for 24 stretcher patients. For self-defence, the Chinook can be armed with three machine guns, one each in



Serial 16-7461 low over a lake. The CH-47F flies with a minimum crew of three – pilot, co-pilot and flight engineer – but, in Turkish service, the regular complement is two pilots, two technicians and a loadmaster.

the right- and left-hand cabin windows and one on the ramp. There are also various self-protection systems, including the Common Missile Warning System (CMWS), radar warning receivers and an infrared suppression system.

Within the scope of the Chinook contract, it was planned that a number of pilots and technicians

would be trained in the US, and most of these courses have now been completed. In-country training activities for other personnel gained momentum once the helicopters at Güvercinlik had been joined by the first group of personnel to complete their education in the US. In 2017, CH-47F pilot and technician training was launched by Turkish instructor pilots within Güvercinlik's Kara Havaçılık Okul Komutanlığı (Army Aviation School Command), although this has since moved to Isparta. The syllabus provided in US Army flight school was used as the basis, but this has since been adapted to meet the requirements of the Turkish pilots and technicians, with new modules being created.

Prospective Chinook pilots will have progressed through fixed- and rotary-wing flight training before completing an advanced syllabus with the Army Aviation School Command. CH-47F pilots are then selected from those aircrew graduating from the school. Currently, since there is no Chinook



Serial 18-7467 (c/n M7467) in formation with S-70A-28 serial 10983. As well as Black Hawks, Chinooks serve at Güvercinlik alongside examples of the AB205A, AS532UL, B200 King Air, AH-1P/W, T129 and UH-1H.





Above: A dramatic head-on view of 18-7467. Power for the CH-47F is provided by a pair of T55-GA-714A turboshafts, each developing a maximum continuous output of 4,168shp and propelling the Chinook at speeds of up to 160kts. Left: Last checks before a night flight from Güvercinlik. The Digital Automatic Flight Control System provides coupled controllability for operations in adverse conditions, including reduced visibility, brown-out and high winds, as well as at night. Below: Serial 16-7461 demonstrates its slung-load capability during a training mission. The CH-47F can carry 26,000lb on the centre hook, 17,000lb on the forward/aft hook or 25,000lb using two hooks in tandem.

simulator at the school, conversion-to-type, maintenance and recurrent training courses are provided by the US Army. In future, it's planned to acquire a CH-47F simulator from either foreign or domestic production.

Heavy-lift missions

One of the main objectives behind Ankara's procurement of a heavy-lift helicopter was the ability to transfer the fire support elements of a commando brigade to the battlefield together with a full crew and ammunition. In addition, the helicopters are used to transport cargo and materiel that can't be accommodated by medium-lift general-purpose helicopters, as well as various external loads. Other functions include serving as a forward arming and refuelling point (FARP) and transporting accident investigation teams.

To prove these capabilities, a six-month period of training activities was undertaken by a US Army Technical Assistance Field Team (TAFT), consisting of a pilot and a technician. In addition, training for planning of airborne operations was conducted within the scope of bilateral military co-operation activities with the US. In addition, there are plans to conduct joint training with the Spanish Army, which also operates the CH-47.

Since entering Turkish service, the CH-47 has conducted numerous training activities together with Turkish Land Forces ground units and other force commands, taking part in joint and combined exercises. These have included transporting external cargoes such as aircraft, armoured vehicles, containers, artillery, etc. Working with the marine corps unit, Chinooks have delivered and retrieved boats, while another pair of Chinooks practised forward refuelling procedures during Operation İmyn. Internal load training under combat conditions has been performed with Turkish Land Forces ground troops, and both free and static parachute operations have been demonstrated. Finally, the Chinook has been trialled in the recovery of downed aircraft.

The next focus of activities will likely involve the Turkish CH-47s taking part in NATO exercises in Europe. The 'big brothers' of Güvercinlik air base are in the ascendancy. **AFM**



Giving support to the International Security Assistance Force (ISAF) mission was one of the Italian Armed Forces' most significant – and enduring – overseas commitments of recent years. While all branches of the military were active in the country, as of 2013 the Aeronautica Militare (AM, Italian Air Force) was providing three task groups: Albatros with C-130J and C-27J transports, Astore with MQ-1C Predator unmanned aerial vehicles (UAVs) and Black Cats with AMX A-11 fighter-bombers. The AMXs took turns rotating in and out of the Afghan theatre with the Tornados of Task Group Devil, which had initially flown from Mazar i-Sharif from November 2008 to December 2009.

These air assets were there to support the wider Italian contingent as it sought to assist the Afghan government in maintaining security, foster the development of facilities and provide training to the Afghan armed forces and help in their reconstruction. The ultimate aim was to smooth the transition process before ISAF ceased operations in the country at the end of 2014.

The Italian contribution was based in Regional Command West – RC(W) – an expansive area of western Afghanistan (as large as the whole of northern Italy) extending over the four provinces of Herat, Badghis, Ghor and Farah. At its peak, the RC(W) contingent was composed of around 8,200 soldiers belonging to ten different nations, including 4,200 Italians.

Task Group Black Cats

The Black Cats arrived at Herat Forward Support Base (FSB) in November 2009 and took on the role of close air support (CAS) and reconnaissance (known in theatre as tactical air recce, or TAR). The detachment was typically composed of 70-80 people, including logistic support, maintenance and flight crews. The Black Cats operated with four A-11s; two of these were available to fly daily missions. The jets had been modernised under the ACOL (Aggiornamento delle Capacità Operative e Logistiche, Operational and Logistic Capabilities Upgrade) programme and were provided with Rafael RecceLite reconnaissance pods – only introduced on the Italian AMX in late August 2009. Using its gimble-mounted sensor ▶

AMX in Af





James Lawrence



JATF

On July 16, 2007, the Joint Air Task Force (JATF) was formally established in Kabul on orders from Italy's Joint Operations Command.

JATF brought together different Italian air assets deployed in Afghanistan, co-ordinating efforts of both fixed and rotary-wing types at their Herat FSB. While the JATF included assets from the air force and navy, those of the army remained independent. An exception were

those Italian Army personnel tasked with preparing airdroppable 'bundles' for the transports.

Key missions involved reconnaissance and surveillance, in support of national and allied ground forces, using AMXs and UAVs; transport of personnel and materiel and airdrops using C-130Js and C-27Js; plus reconnaissance, transport and medical evacuation using Italian Navy EH101 helicopters.

The JATF played a fundamental role in the transition process in Afghanistan, which gradually transferred responsibility for security and governance of the country from ISAF to the Afghan government.

ghaniistan

The Italian Air Force's Task Group Black Cats were among the unsung heroes of the operation over Afghanistan. **Gian Carlo Vecchi** looks back at the missions flown by the unit's AMX A-11 fighter-bombers and speaks to the task group's commander.



An A-11 adopts a nose-up attitude to hold station with the camera ship during a sortie from Herat in 2011. Note the RecceLite pod carried on the centreline station and the ISAF insignia worn on the engine intake. All photos Gian Carlo Vecchi unless stated



head, this pod automatically gathers images after the co-ordinates have been uploaded and is then able to 'follow' the target for optimum coverage.

Targets for the TAR task in the Afghan theatre were requested directly by ISAF Joint Command (IJC). With different sensors available on the RecceLite pod, pilots and analysts planned missions with the aid of a Ground Exploitation Station (GES). During the planning phase, the task group would look at the requirements and take into account potential threats and weather conditions, features of the area etc, while the analysts would provide recommendations based on the precision of the different sensors. Depending on the required essential elements of information (EEIs), the workload could change exponentially.

RecceLite advantage

The degree of precision available using the RecceLite meant that the Black Cats could provide a remarkable level of detail to ground troops when they needed it most. For example, troops performing an operation inside a compound might have needed to know the height of the walls, presence of adjacent ditches, escape routes, window dimensions and other factors. The task group could gather such data via the pod and, using the data link, have the required imagery available in just a few seconds.

Using the ROVER (Remote Operated Video Enhanced Receiver) system, images could be



transmitted to ground troops or a Joint Terminal Attack Controller (JTAC). This was especially useful for identifying any 'vulnerable points' – sites where improvised explosive devices (IEDs) might be located. Speaking to *AFM*, the then commander of the Italian Joint Air Task Force (JATF), Colonnello Gianluca Ercolani, observed: "The possibility to provide images in almost real time to the command and control centres shortens and makes the decision-making process easier and more effective. The overhead control of personnel and materiel is essential in view of the difficulties related to the topography of the Afghan territory."

Close air support

The other key activity for the AMX in Afghanistan was CAS, provided to ground troops, including convoys and patrols. When the A-11s were in theatre, this task alternated between the Black Cats and rotary-wing assets capable of carrying out armed reconnaissance. Initially only able to call upon their internal 20mm M61 Vulcan cannon, from 2012 onwards the A-11s were authorised to use 1,000lb (454kg) GBU-16 Paveway II laser-guided bombs. In this way, the task group provided support to troops in contact (TIC) and special forces. During a TIC scenario, the main goal was to break the contact, preventing any human loss on both sides.

The pilots of the task group eventually learned where to find particularly sensitive



2

1: A two-ship of recce-configured A-11s on patrol somewhere over Regional Command West. AMXs from the 51st Stormo and 31st Stormo at Amendola replaced Tornados in Afghanistan in 2009, arriving in Herat in November, initially to carry out ISR activities. 2: The port for the 20mm M61 Vulcan cannon is clearly visible in the left-hand side of the nose as A-11 MM7198 '51-44' rolls past temporary hangarage at Herat. In 2011, the Black Cats reached the milestone of 2,500 flight hours over Afghanistan with its fleet of four ACOL-upgraded AMX jets, all from the 51st Stormo at Istrana. 3: A pilot of the Task Group Black Cats in his 'office' on the Herat flight line. The ISAF mission lasted until the end of 2014, when the transition of security responsibilities to Afghan national forces and civilian authorities was completed. 4: A-11 MM7175 '51-45' taxis out for its next mission from Herat. Key campaigns of the Herat-based AMXs included the JATF-organised Operation Ballpark in September 2013, when they provided security against IEDs and insurgent attacks along Highway One. 5: RecceLite-toting A-11 MM7175 '51-45' performs a low flyby over Herat. Most of the sorties conducted by Italian combat jets over Afghanistan were intelligence, surveillance and reconnaissance (ISR) activities, but fighters were also used for close air support to ground troops engaged with insurgents.



3

"The possibility to provide images in almost real time to the command and control centres shortens and makes the decision-making process easier and more effective."

Colonnello Gianluca Ercolani



4



1: A-11 MM7126 '51-61' flies close escort to Task Group Shark's EH101 MM81635 '2-20' over Afghanistan. The helicopter was assigned to the 1° Gruppo Elicotteri of the Italian Navy home-based at Luni-Sarzana. Note the MG 42/59 machine gun on the rear ramp of the Amphibious Support Helicopter version. **2:** Two examples of the imagery gathered by the RecceLite pod by Task Group Black Cats, showing examples of human activity in urban areas of Regional Command West. This type of mission was of critical importance: using photographic material, the higher authorities in Afghanistan were able to see how reconstruction work on the ground was proceeding and whether the country was returning to normal life. **3:** A pilot checks the ammunition for the 20mm M61 Vulcan gun during a pre-flight walkaround. As a secondary duty, the AMX carried out armed overwatch missions. The presence of the Black Cats ensured that land operations could be conducted safely and that ground troops were protected from insurgents. **4:** Pilots conduct final checks in the cockpits of a pair of A-11s ahead of a mission from Herat. As of May 2013, AMXs had been engaged in more than 2,400 day and night sorties, covering 6,300 targets in Afghan territory.



points – such as bends in roads, bridges, crossings and hills – that could pose a hazard to ground troops. In this way, they provided fundamental support both in the pre-operation phase and during the CAS mission itself.

Task Group Black Cats could work co-operatively with UAVs, helicopters and other CAS assets, while aerial refuelling increased their on-station time.

The AM's deployed AMXs returned from Herat for the last time on June 20, 2014, landing at Pratica di Mare. The final deployment to Afghanistan had been completed by personnel from the 32° Stormo and the 51° Stormo. Soon after, the 32° Stormo's final 101° Gruppo was transferred to the 51° Stormo, bringing all remaining AMX squadrons under the command of the same wing at Istrana. The AM achieved 100% readiness for all its AMX missions in Afghanistan and not a single flight-hour or mission was cancelled. **AFM**



Task Group Black Cats commander

Then a major (maggiore), Stefano De Dionigi was in charge of the Black Cats while they were deployed at Herat in 2011. He left the theatre in September that year to assume command of the 132° Gruppo flying the AMX back in Italy. Speaking to *AFM*, he recalled some of those combat experiences.

AFM: What were the main missions of the Black Cats in Afghanistan?

Stefano De Dionigi: "The task group mostly provided patrolling and support to the troops. We reported to the Kabul ISAF Joint Command, which set the targets and areas to scout and their deadline – when the images had to be sent – which could be immediate or in a few days. In practice, when certain images were needed, the command specified their use and objective, which helped the Black Cats' team to evaluate the specific characteristics of a mission – for example, if road measurements, the width of certain objects or other details were needed – so as to optimise the RecceLite system.

"The RecceLite system was introduced on the AMX at the end of August 2009 and took the place of the Orpheus pod, a wet-film system with cameras set at fixed angles, which forced the pilot to position the aircraft to gain the perfect angle on the target. The new system had moving cameras – it was enough to set the co-ordinates and then it automatically followed the target. It was no longer necessary to pass over a certain point: the system knew exactly where to find the target, even if the jet was misaligned by 500ft.

"Moreover, thanks to equipment at the base in Herat, even when flying, we had the possibility to download images via data link, allowing us to provide them immediately. Technicians could then verify the imagery and signal any hazards found in the area. The old system required us to land before the films could be developed to analyse the images.

"The system offered other advantages. If, for any reason, there was particular urgency, the team could upload a mission and give the pod instructions for certain co-ordinates, so the pilot could immediately carry out an unplanned mission. The pilot could modify the data by manually inputting the type of sensor (electronic, optical, infrared etc) based on the desired width and definition.

"The Orpheus didn't provide images to the cockpit, while RecceLite made this possible in real time so the pilot could account for any mistake or improve the imagery. Another highly appreciated feature was the so-called 'tiling', in which the system took different frames of

the target and, depending on whether 3D vision or simple coverage were needed, overlapped the images. RecceLite overlapped a small percentage of images to be sure to completely capture the target or it could overlap more than 50% if 3D was required. With the old system, we had to physically develop, cut and assemble the frame, while now this procedure was automatically performed by the system, with a huge time reduction."

AFM: What were your typical targets for reconnaissance?

Stefano De Dionigi: "There were many different targets. Sometimes there were tents belonging to nomadic tribes following their herd, who might be settled in a place for a few months; we constantly monitored them and could see important changes. Then we also checked the security of the Afghan people; we followed the development and reconstruction of a particular area, traffic, commercial activities etc. If we saw these were full of people – for example, a market whose parking spots were full – we could confirm the return of a normal way of life. Moreover, we took care of all the areas in which our ground forces were operating by providing them with detailed images of the roads, compounds or of specific locations."

AFM: How did you conduct missions at night?

Stefano De Dionigi: "The task group made a lot of use of infrared images. These were easily examined, since the heat emission allowed us to see if a vehicle had just arrived or if it had been parked for a few hours. If, for example, we flew over an area after nightfall we might not be able to see any visible vehicle. But using the infrared [IR], we would know exactly how many cars were parked by the heat signal on the road. We could also see the IR traces of fireplaces inside a compound."

AFM: What was the procedure for flying CAS missions?

Stefano De Dionigi: "CAS was another fundamental activity and basically comprised assistance and patrolling on behalf of ground units and vehicles; it was an important task that we performed together with other assets. We basically positioned the AMX over the troops to monitor movements of enemies or civilians, so that we could communicate with them. The task group provided armed support in case of TIC [troops in contact] and we supported special forces troops.

"The task group only worked under ISAF mandate and we only used our weapons in case of a TIC. We had a range of other options, including flying very low, flare launch and others that were effective in 99% of cases. We were automatically a deterrent – just hearing an airplane over the troops helped our allies' morale and

discouraged the insurgent. We also paid much attention to collateral damage, because having a dead civilian was one of the worst things that could happen – we wanted the local populations to understand that our mission was helping rebuild Afghanistan, not firing over it.

"In practice, the AMX received the pictures and transmitted them to the JTAC who received the images on a laptop, thus providing a real-time view from above. For example, in a 'hot' zone we might give pictures of the street to a patrol, showing them that the roads were safe, and no threats were present around the corner.

"We signalled possible 'vulnerable points', which were studied during the planning to avoid ambushes or points where IEDs could be positioned.

If we noticed a bump in the ground or stones that were not present before, we indicated them, as they might be markers for an IED. The troops could avoid the area or call in an anti-IED team.

"If we noticed aligned stones in the middle of the desert, that would very likely have been created by people and present a possible threat for our forces. We highlighted the area as a 'possible marker', 'possible IED position' or 'possible vulnerable point'."

AFM: What is your overall assessment of the ISAF mission?

Stefano De Dionigi: "When I was in Afghanistan, the ISAF mission was in a reconstruction and transition phase. Italy very closely followed this transition towards a complete autonomy of the government and Afghan troops, while at the same time helping to reconstruct schools, infrastructure, etc. During scouting operations, we often saw a basketball court or other constructions in a school yard where before there was nothing, meaning that normal life was starting again.

"Another critical resource was water and where it was located, especially near Highway One, a large circular road that crosses different provinces and is the main communication route. There are other areas with high mountains and no roads, so life developed around this principal road. Our task was to constantly monitor these areas and we managed to help the local populations live in peace.

"We often think of the pilot as the essential element in flying activities, but actually the pilot is just the final element. Behind them are people, including technicians, who quietly give their best every day. In looking back at the deployment, it is essential to thank the personnel – they were the heart and soul of the Task Group Black Cats." **AFM**



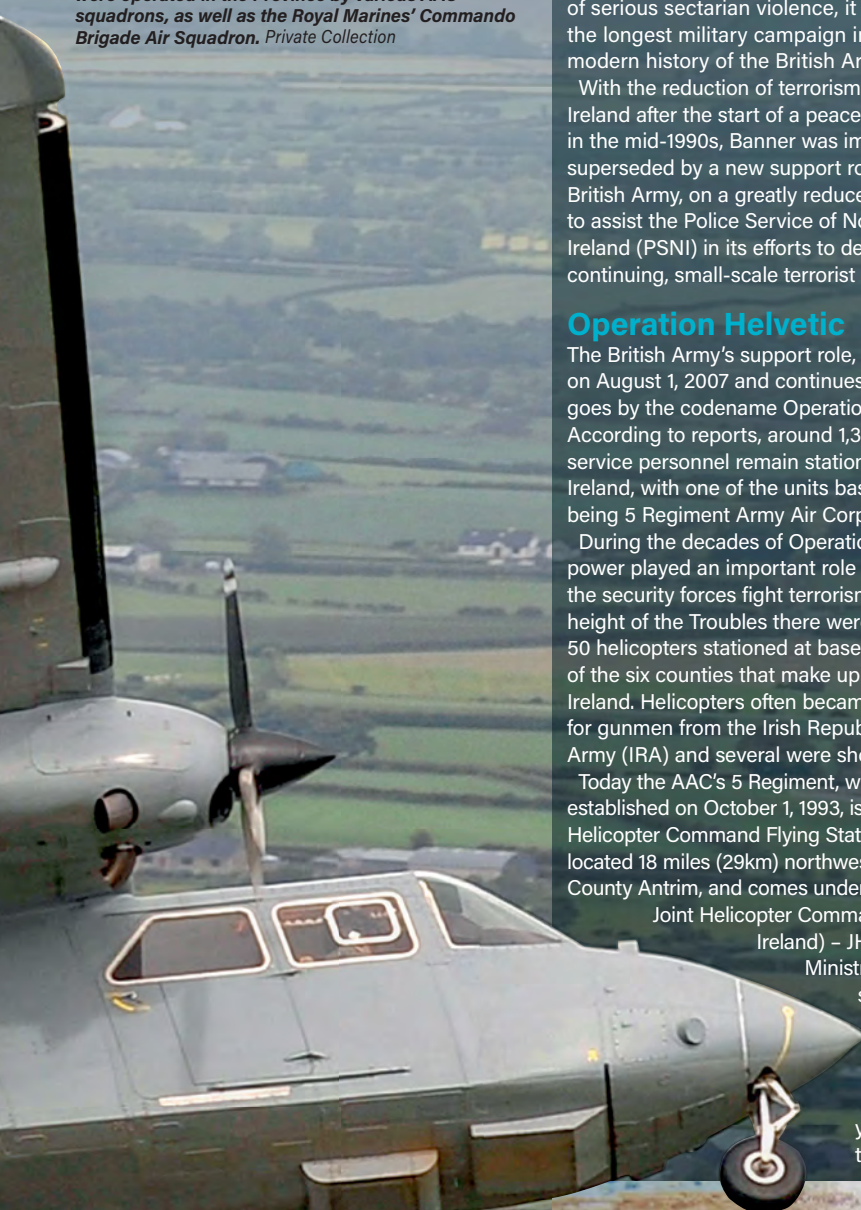
Operation Helvetic

AIR SUPPORT

Steven Taylor examines the British Army Air Corps' current support role to the Police Service of Northern Ireland in the ongoing fight against terrorism.



Main image: Islander AL1 ZG848 (c/n 2199) assigned to 651 Squadron over the Northern Irish countryside. The Islander has served in Northern Ireland since 1989; this example is still active as an R1. Private Collection Below: Gazelle AH1 ZB671 (c/n 1958) operated by 665 Squadron, just after taking off from the helipad at Observation Post R12 on a remote South Armagh hilltop. During the Troubles, Gazelles were operated in the Province by various AAC squadrons, as well as the Royal Marines' Commando Brigade Air Squadron. Private Collection



Operation Banner, the British Army's peacekeeping mission in Northern Ireland during the conflict widely known as the Troubles, came to an end on July 31, 2007. Having been activated in summer 1969, to restore some form of order in the Province amid an outbreak of serious sectarian violence, it became the longest military campaign in the modern history of the British Army.

With the reduction of terrorism in Northern Ireland after the start of a peace process in the mid-1990s, Banner was immediately superseded by a new support role for the British Army, on a greatly reduced scale, to assist the Police Service of Northern Ireland (PSNI) in its efforts to deal with continuing, small-scale terrorist activity.

Operation Helvetic

The British Army's support role, which began on August 1, 2007 and continues to this day, goes by the codename Operation Helvetic. According to reports, around 1,300 British service personnel remain stationed in Northern Ireland, with one of the units based there being 5 Regiment Army Air Corps (AAC).

During the decades of Operation Banner, air power played an important role in supporting the security forces fight terrorism. At the height of the Troubles there were around 50 helicopters stationed at bases in each of the six counties that make up Northern Ireland. Helicopters often became targets for gunmen from the Irish Republican Army (IRA) and several were shot down.

Today the AAC's 5 Regiment, which was established on October 1, 1993, is based at Joint Helicopter Command Flying Station Aldergrove, located 18 miles (29km) northwest of Belfast in County Antrim, and comes under the control of

Joint Helicopter Command (Northern Ireland) – JHF (NI). The

Ministry of Defence states: "The 'Normalisation Process' of recent years has led to a gradual



reduction in the need for helicopter support and, as of August 1, 2007, JHF (NI) now provides Gazelle and Islander aircraft in support of the Police Service of Northern Ireland and military units."

Until recently, 5 Regiment AAC consisted of 651 Squadron, equipped with the fixed-wing Islander AL1 and Defender AL2 (based on the larger BN-2T-4S Defender 4000), and 665 Squadron, with its Gazelle AH1 helicopters. As of April 1, 2019, control of 651 Squadron formally passed to the RAF, although it remains stationed at Aldergrove, under JHF (NI). Meanwhile, the designations of the fixed-wing types have been revised, the Islander AL1 and Defender AL2 becoming the Islander R1 and Defender R2, respectively.

The 'dissident' threat

The primary task of the Gazelles, Islanders and Defenders under Operation Helvetic is Manned Airborne Surveillance (MAS). Although the Provisional IRA, the largest and most deadly of the terrorist organisations active during the Troubles, called a ceasefire in 1997 and announced it was disbanding in 2005, there remains a low level of related violence. Most is carried out by a dissident republican organisation dubbed the 'New IRA' by the media, which came into being in 2012 through an amalgamation of several small groups, including the Real IRA.

Since Helvetic started over a decade ago, official PSNI statistics calculate there have been 29 deaths in the Province linked directly to terrorism. Between July 2018 and June 2019, the PSNI also revealed, there were 17 bomb-related and 40 shooting incidents. The ►





Security Service (better known as MI5) has stated that: "although security force pressure is successfully constraining the threat and all dissident republican groups are under pressure, some attacks continue to get through".

Unlike the days of the Troubles, today the British Army plays a strictly limited role in support of the police – known as Military Aid to the Civil Authority (MACA) – mainly in the form of bomb disposal through its Explosive Ordnance Disposal units.

The PSNI explains: "Other military support required to counter terrorism may, in exceptional circumstances, include a request for air support. There are two circumstances when military Support Helicopters (SH) could be made available: if there is an immediate threat to life under MACA then military may authorise the use of SH free of charge, and deliberate operations involving a period of planning." However, the latter would require MOD authorisation.

The AAC's 665 Squadron first deployed to

Northern Ireland in 1971 as part of Operation Banner, equipped with a mix of Westland Sioux and Scout helicopters. It later operated Gazelles on deployments to the Province.

The Gazelle, which first flew in 1967, replaced the Sioux in the surveillance and liaison role in Northern Ireland from 1976, serving with numerous AAC squadrons as well as the Royal Marines' Commando Brigade Air Squadron (CBAS). With a two-man crew it can carry up to three passengers and is fitted with a variety of cameras and sensors, including thermal-imaging equipment. Gazelles were widely used for aerial surveillance during the Troubles and in support of special forces operations, particularly those of the British Army's elite 14 Intelligence Company.

It has been reported in the British press that 14 Intelligence Company's successor, the Special Reconnaissance Regiment (SRR), has also periodically deployed in small numbers to Northern Ireland as part of Operation Helvetic, to track terrorist suspects, and it's

highly likely that the Gazelles of 665 Squadron have provided support. In keeping with UK government policy, the MOD refuses to comment on the operations of special forces.

The second unit that makes up 5 Regiment is 651 Squadron. Its history in the Province can be traced back to 1957, the year of the modern AAC's formation. As 13 Flight 651 Squadron, consisting of five Auster fixed-wing spotter aircraft, it deployed to RAF Aldergrove to support the Royal Ulster Constabulary, the predecessor of the PSNI, during the IRA's unsuccessful 'Border Campaign' of the late 1950s.

Islanders and Defenders

The squadron later became a rotary-wing unit, operating the Scout, Gazelle and Lynx in Northern Ireland. It returned to fixed-wing aviation in 2006, when it was re-formed at RAF Odiham, Hampshire, with the Defender 4000, which served in Iraq and Afghanistan in the intelligence, surveillance, target acquisition and reconnaissance (ISTAR) role. In August 2008





3

the squadron moved to Aldergrove, absorbing the resident 1 Flight (equipped with the Islander AL1) where, besides its overseas commitments, the unit's mix of Islanders and Defenders continue to provide support for Operation Helvetic. Now, however, they are part of the RAF's No 1 Group, aligning them with the rest of the UK's ISTAR assets. In addition to its three Islander R1s that are being upgraded, 651 Squadron also operates eight larger Defender R2s and a single Defender T3 training variant.

The Islander has served in Northern Ireland since March 1989. Its main task is photo-reconnaissance, providing imagery for analysis by the Reconnaissance, Intelligence and Geographic Centre (Northern Ireland), also based at Aldergrove, while it performs a secondary function as a light transport type. The Defender, which first flew in the mid-1990s, is an upgraded variant of the dependable Islander, with a lengthened fuselage, a slightly redesigned nose and improved range and performance.

End of an era

On September 20, 2009, Aldergrove ceased to be an RAF station when it was transferred to tri-service command and renamed Joint Helicopter Command Flying Station (JHCFS) Aldergrove. Besides 5 Regiment, it is also home to the PSNI's Air Support Unit, which comprises a single EC135 and a pair of the larger EC145s.

Aldergrove was first established as an RAF station in 1918 and became a key air base throughout the Troubles. On several occasions during that long conflict the base came under terrorist attack. The most serious incident occurred on March 6, 1976, when the IRA fired over a dozen mortar bombs at Aldergrove, fortunately without causing any serious casualties.

That terrorists can pose a threat to air crews was underlined in August 2013, when a splinter group from the Real IRA used a hoax bomb warning to try to lure either a PSNI helicopter or an AAC Gazelle to a wooded area near the South Armagh village of Cullyhanna, with the intention of shooting it down with

a home-made mortar. The security forces, suspecting an ambush, held back and the terrorists abandoned their mortar, which was made safe by British Army EOD specialists.

Political uncertainty surrounding Brexit has also brought more attention to the security situation in the Province, with some quarters suggesting that if a so-called 'hard' border were to be re-established on the island it could lead to increased violence and civil unrest.

Overall, however, recent years have seen the intensity of terrorism slacken (the number of attacks falling by more than half since 2014, according to PSNI statistics), and there has been speculation over the long-term future of 5 Regiment AAC. In 2017 there were press articles suggesting that, as part of UK defence cuts, the British military's ageing fleet of 34 Gazelles – due to remain in service until 2025 – was to be retired early. However, reports of 5 Regiment's demise appear to have been premature and, for the moment at least, the future of British Army aviation in Northern Ireland looks secure. **AFM**



5

1: A rare view from the cockpit of a 651 Squadron Islander on approach to Flying Station Aldergrove. Guy Warner
2: Serial ZB689 (c/n 2002), the last Army Air Corps Gazelle to land at Bessbrook on June 21, 2007. This aircraft remains in service with 665 Squadron today. The Country Armagh village of Bessbrook saw some of the worst violence in the Troubles. Over the course of the peace process, the Police Service of Northern Ireland spent years building up relationships with communities which had been hostile historically. Guy Warner

3: An Islander AL1 of 651 Squadron at Aldergrove with a Gazelle of 665 Squadron in the background. Now part of the RAF's ISTAR Force, the Defender and Islander have received revised designations, the R (for Reconnaissance) more accurately reflecting their role compared with the previous AL (Army Liaison). Private Collection
4: Flown by 665 Squadron, Gazelle AH1 XW846 (c/n 1009) is photographed over the iconic Harland and Wolff cranes in Belfast. Private Collection
5: Gazelle AH1 ZB670 (c/n 1951) of 665 Squadron in Northern Ireland, fitted with a thermal imaging camera on the starboard-side stores boom. In May 2018 Joint Helicopter Command announced that Airbus Helicopters had been awarded a contract to maintain the Gazelle fleet until 2022, by which time the type will have been in service for almost half a century. This particular helicopter is now preserved as a gate guard outside the Taunton Army Reserve Centre, Somerset. Private Collection

The Eurofighter has been operating as a multi-purpose jet in Luftwaffe hands for almost two years now, finally cleared for both air-to-air and air-to-surface missions. Oberstleutnant (Lt Col) Danilo Schlag of Taktisches Luftwaffengeschwader 31 'Boelcke' (TaktLwG 31 'B') explained: "At the start of 2018, a module of [TaktLwG 31 'B'], consisting of six multi-role Eurofighters, was assigned to the NATO Response Force [NRF] and remained there throughout 2019." Schlag is the commanding officer (CO) of the wing, based in Nörvenich near Cologne. "In addition, a further module of multi-role Eurofighters from TaktLwG 74 in Neuburg was also assigned in 2019 as part of the NRF," he added.

Pioneer work

Back at the end of 2016, TaktLwG 31 'B' had been tasked with the lead role in introducing the Eurofighter's air-to-surface capability. "We had to start by evaluating what type of missions the German Eurofighters could take on in the air-to-surface role given their weapons and configuration," explained Schlag. After initial trials with Tornado pilots who were experienced in the role, a syllabus was developed with theory, flying and simulator components, and procedures and rules were set out. "The first ten pilots from


Nörvenich and Neuburg were trained on this basis," Schlag added. The training consists of roughly equal parts of real and simulator flights. Student pilots are required to have undergone air-to-air training first. Once they have completed their air-to-surface training as well, they become multi-role pilots. "In the short time available, the wing did pioneering work for the Luftwaffe's Eurofighter fleet. And it can be very proud of that," said the CO.

In December 2017, immediately before taking on the NRF assignment, the GBU-48 all-weather-capable precision bomb, manufactured by Diehl Raytheon Missile Systems, was symbolically handed over to the Luftwaffe in Nörvenich by the Bundesamt für Ausrüstung, Informationstechnik

Into the fighter-bomb



Above: Two Eurofighters of the Weapons Instructor Course (WIC) 02/19 organised by TaktLwG 73 'Steinhoff' on the way from their home base of Laage to the Vidsele range in Sweden. The mission lasted 4hrs 45mins, involved two air-to-air refuellings and culminated in a live bomb release. Above right: Stabsfeldwebel (Sergeant Major) Raphael Mörs-Zander checks the attachment of a GBU-48 on a Eurofighter of TaktLwG 31 'Boelcke' at Nörvenich. The bomb was integrated together with the German-specific FBM-21 GER detonator. All photos Dr Stefan Petersen



und Nutzung der Bundeswehr (BAAINBw, the Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support). The GBU-48 has a range of up to 15.5 miles (25km) and finds its target with a deviation of less than 33ft (10m). The bomb underwent a time-intensive qualification process together with the new German-standard detonator, the FBM-21 GER, and both were integrated into the Eurofighter weapons system at the same time. The certification process was completed in September 2017, with operational testing carried out by the Manching-based Wehrtechnische Dienststelle 61 (WTD 61) flight test centre, making use of the Vidsel range in Sweden. The centrepiece of the GBU-48 (Guided Bomb Unit 48) is a conventional Mk83 bomb body with a nominal weight of 1,000lb (454kg) that is enhanced by adding equipment to become a GPS- or laser-guided weapon. It is guided by a Litening III laser designator pod (LPD) manufactured by the Israeli company Rafael, which is attached under the fuselage of the jet. The LDPs are serviced and maintained centrally for the Luftwaffe in Nörvenich. The standard load for the Eurofighter in the air-to-surface role is four GBU-48 bombs, which adds around two tonnes of extra weight. Consequently, WTD 61



took a close look not only at the bomb release process but also at changes to the jet's flying behaviour. A further test campaign – carried out jointly by WTD 61, the Gruppe Technik, Taktik und Weiterentwicklung von Verfahren (TTVG, the Tactics, Technology and Procedures Group) and TaktLwG 31 'B' – took place in early summer, again at the Vidsel range in Sweden.

Long-range raid

Vidsel was also the destination of a long-range mission that three jets carried out at the beginning of July, as part of the Weapons Instructor Course (WIC) 02/19 run by TaktLwG 73 'Steinhoff'. Two ▶

over business

The Luftwaffe's Eurofighters are no longer flying exclusively air-to-air tasks. As **Dr Stefan Petersen** discovered, they are now also operating in the air-to-surface role with precision-guided bombs.

German Eurofighters

single-seat Eurofighters fitted with four GBU-48 bombs each left their home base of Laage in the early morning. In the cockpits were the head of the WIC, Oberstleutnant Julius Kurbel, plus a second weapons instructor. Accompanying them was a two-seater flown by two WUGs (weapons undergraduates, as the course participants are called). The mission lasted 4hrs 45mins, involved two air-to-air refuellings and culminated in a live bomb release. Kurbel recounted: "After taking off and completing the first refuelling with an A400M, we were in the air for three hours and flew over 1,000 miles before the mission actually began," Kurbel noted. After they had refuelled again off the Swedish coast from a Luftwaffe A310 Multi-Role Tanker Transport (MRTT) flying from Norway, the two single-seaters each released two GBU-48 bombs and landed in Vidsel. On the following day, the WUGs dropped the remaining bombs before all three jets returned to their home base.

The WIC is an advanced course and 'combat ready' status is a prerequisite for taking part. "WIC 02/19 was the first weapons instructor course that reflects the new multi-role capability," said Kurbel. "A large part of it was devoted to air-to-surface weapons deployment, and this mission was a critical part of that phase, half of which takes place in the simulator." It was preceded by a two-week campaign with Joint Terminal Attack Controllers (JTACs), during which training was



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1: Even with a full bomb load the Eurofighter is very agile. This photo provides a good view of the GBU-48 precision bomb, manufactured in Germany by Diehl Raytheon Missile Systems. 2: These two single-seat 'Steinhoff' Eurofighters headed from Laage to Vidsel comprised 30+56 (GS040) and 30+47 (GS032). The wing runs the Luftwaffe weapons school alongside the Eurofighter weapons system training effort. 3: Aerial refuelling of two Eurofighters by A400M 54+10 (c/n 049) of Lufttransportgeschwader 62. The A400M was flying from its home base at Wunstorf, supported by an A310 MRTT forward deployed to Norway. 4: WIC air-to-surface training also includes working together with Joint Terminal Attack Controller (JTAC) teams, who co-ordinate close air support sorties from the ground. Only 'combat ready' pilots are selected for WIC. 5: A live GBU-48 is prepared for night arming on a Eurofighter of TaktLwG 31 'B'. The wing is now looking forward to flying day and night multi-role missions at Exercise Red Flag in 2020.



German Eurofighters

given on working together to provide close air support (CAS). These specially trained soldiers act as the eyes of the pilot on the ground, co-ordinate the use of aircraft and ground troops and assign targets to the jets flying CAS. The Surface Attack Standard (SAS) phase of the course also included gunnery missions at the Dutch firing range of Vlieland.

RAF crash course

The main WIC instructors had prepared themselves for the air-to-surface role during 2018 with an intensive course they developed on their own. "At the end of 2017, two of us took a crash course with the Royal Air Force. Following that introduction and with the knowledge of a weapons instructor coming from the Tornado, we developed a four-block training [programme]," said Kurbel. "After a simulator phase and a close air support phase in Neuburg, we assisted the Tornado weapons instructor course of TaktLwG 51 'Immelmann' at Jagel operating from Nörvenich, and finally demonstrated our capabilities at the Cobra Warrior exercise in the UK, as attack package commanders in combined air operations." Expertise from Nörvenich was called upon in each phase: "For quality assurance and to prevent us from walking in the wrong direction," as Kurbel put it. An experience report was planned after WIC

The typical air-to-ground load of four GBU-48 bombs, two IRIS-T infrared air-to-air missiles and the laser designator pod under the belly. All Luftwaffe wings now include Production System Configuration 12 jets suitable for air-to-surface weapons deployment.

02/19 to make the lessons learned available to the basic syllabus at TaktLwG 31 'B'.

Meanwhile, the air-to-surface training in Nörvenich is continuing on an ongoing basis. "At the same time, the pilots assigned to the NRF must be kept combat ready in both roles," explained the CO.

In terms of hardware and software, all Eurofighters of Tranches 2 and 3 with the Production System Configuration (PSC) 12 are suitable for air-to-surface weapons deployment. "The jets of both tranches will be raised to this standard successively by

the maintenance personnel of the wings," said Schlag. PSC 12 aircraft are now present in all Luftwaffe Eurofighter wings.

Green Flag – West

By May 2018 TaktLwG 31 'B' had already taken part in the Green Flag – West exercise at Nellis Air Force Base in Nevada and demonstrated its CAS capabilities under realistic conditions with live GBU-48 drops and gunnery. "We gained a lot of valuable experience during this deployment," said Schlag. Participation in the Luftwaffe's LVGEx performance verification exercise in Laage in October 2018 was also important in terms of gaining new insights (see *Luftwaffe under test*, March 2019, p38-41). Both exercises were flown together with Tornados of TaktLwG 33 from Büchel. "In 2019 we have concentrated on training further pilots and were involved in Frisian Flag," Schlag added.

In addition, the wing is preparing itself for participation in the Red Flag exercise at Nellis in 2020. "We will be flying in large combined air operations as a multi-role platform, both day and night," Schlag told *AFM*. Additionally, work is under way to examine whether the Eurofighter can also take on reconnaissance tasks, where needed, with the RecceLite pod, which is similar in design to the LDP. "This is essentially to provide redundancy for the Tornado," says the Oberstleutnant. The planned procurement of newer-generation targeting and reconnaissance pods is keenly awaited: "We want to further improve the capability of our Eurofighters as quickly as possible." **AFM**

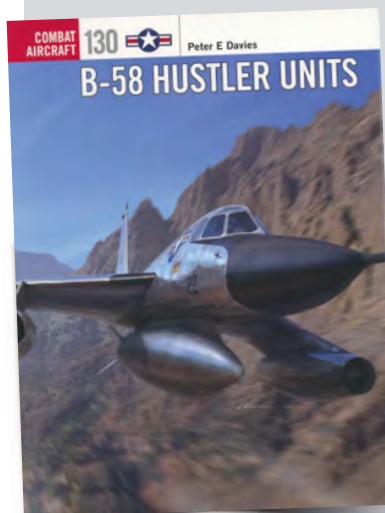


Two Eurofighters taking part in WIC 02/19 at TaktLwG 73 'S' take on fuel from an A400M of Lufttransportgeschwader 62. The 'Steinhoff' wing was the Luftwaffe's first Eurofighter operator, receiving its initial aircraft in 2004.



A400M 54+10 of Lufttransportgeschwader 62 makes use of the type's roll-on/roll-off air-to-air refuelling system. As a tanker, the aircraft can refuel two aircraft simultaneously and deliver around 40 tonnes of kerosene, refuelling up to ten aircraft in an hour.

Combat Aircraft 130 B-58 Hustler Units



The B-58 Hustler epitomised the belief that sheer power and speed would allow a bomber to get through an enemy's defences. With a speed of Mach 2.2, the nuclear-capable B-58 became

the poster child of Strategic Air Command (SAC). The bomber pushed technology to its limits and Convair drew on ten years of experience in building delta-wing aircraft.

The Hustler could fly at 1,000mph (1,609km/h) for several hours, guided by onboard automatic systems, and had a fighter-style cockpit. But despite its outstanding performance, the Hustler was hindered by its operating cost and the advent of Soviet surface-to-air missiles.

Following the familiar format of Osprey's Combat Aircraft series, this latest title explains for the first time the thinking of SAC's senior staff that led to the development of the B-58. The problems Convair encountered during the operational testing phase – along with the impressive tally of world records that the

supersonic bomber achieved – are all recounted in some depth. Despite the operational potential that the Hustler had to offer SAC, the type was to serve on the front line for just ten years. Although the bomber was never fielded in the numbers planned, it later proved to be the ideal test platform for a multitude of future programmes. B-58s were used in developing weapon release procedures and new tactics and missions, each of which are documented in detail.

At its time the B-58 was the fastest nuclear bomber in the world. This remarkable aircraft now has a worthy book to record its extraordinary achievements. **Glenn Sands**

Publisher: Osprey Publishing
Author: Peter E Davies
Pages: 96
Price: £14.99
ISBN: 9781472836403



Designed as a mass-produced and relatively cheap lightweight tactical fighter, the MiG-29 first flew in October 1977. It entered production in 1982 and deliveries to the Soviet Air Force began a year later. The MiG-29, known as *Fulcrum* in the West, became one of the Soviet Air Force's main fighter types and a successful export. Nearly a third of the 1,500 first-generation *Fulcrums* built up to 1996 went to foreign customers. In some ways,

Famous Russian Aircraft Mikoyan MiG-29 & MiG-35

it mirrored the development of the West's F-16 that transitioned from a lightweight day fighter to an all-weather, multi-role warplane.

Continued development of the basic aircraft – which was later upgraded and produced as the multi-role MiG-35 – has led to the authors updating their earlier edition on the *Fulcrum* to provide an in-depth analysis on the development, operational employment and future of the aircraft. This extensively revised volume features new chapters that use previously classified material including engagements between F-15s and MiG-29s during the conflict over Yugoslavia

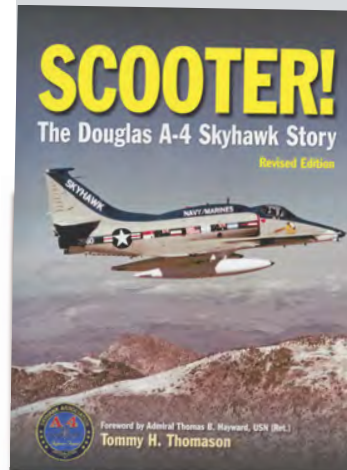
in 1999. Somewhat bizarrely, the authors put forward the possibility that the F-117 lost during NATO's intervention was downed by a *Fulcrum* and not a surface-to-air missile.

Supplementing the text are production lists, previously unpublished photographs and line drawings. This is the definitive guide to the *Fulcrum* and is unlikely to be bettered. **Glenn Sands**

Publisher: Crécy Publishing
Authors: Yefim Gordon and Dmitry Komissarov
Pages: 550
Price: £44.95
ISBN: 9781910809228

These titles are available from: The Aviation Bookshop, 31-33 Vale Road, Royal Tunbridge Wells, Kent, TN11 1BS, United Kingdom. **Telephone:** +44(0)1892 539284 **Website:** www.aviation-bookshop.com

Scooter! The Douglas A-4 Skyhawk Story



Still flying more than 60 years after the first prototype took to the sky, the Douglas A-4 Skyhawk has been the subject of countless aviation publications, but none have gone into as much depth as this one. Tommy H. Thomason's text is supported by a stunning collection of images gathered from official and private sources. Crammed into the ten chapters is as much of the complete story of the A-4 as is possible considering the type is still in service with a handful of nations and private contractors.

The level of detail can be seen in chapter three, in which the author includes the plan diagrams of how Skyhawks were parked on the hangar decks of the US Navy's Essex-class carriers. This was a first for me and suggests this volume will be viewed as the definitive title on the A-4 by all those interested in the aircraft.

The combat operations of US Navy and US Marine Corps A-4s over Vietnam have been well documented in the past, but the author has found a new way to approach this with recollections from pilots that have not appeared in print before. The same approach is used in other theatres where Skyhawks saw action, including the Middle East and the Falklands. **Glenn Sands**

Publisher: Crécy Publishing
Author: Tommy H. Thomason
Pages: 288
Price: £27.95
ISBN: 9781910809266

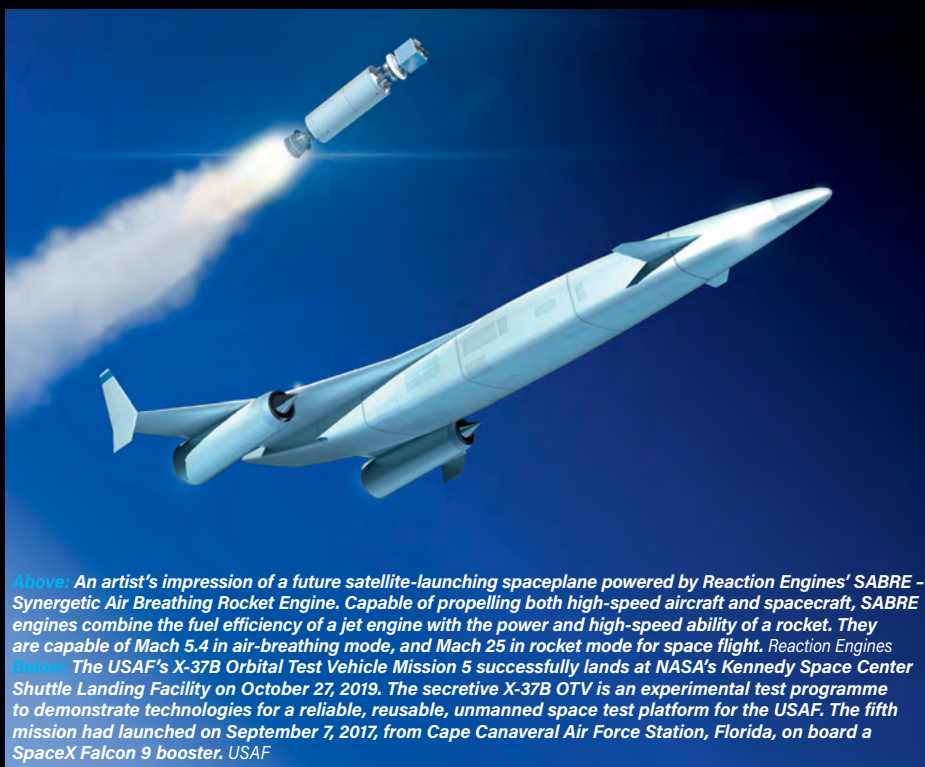
Space the next frontier

In summer 2019, the Ministry of Defence outlined an ambitious space programme, including committing £30m to fast-track the launch of a small satellite demonstrator within a year. It's just one indication of the growing importance of space to modern air forces, as Air Power Association President, **Air Marshal (ret'd) Greg Bagwell CB CBE** explains.

The US Air Force's secretive X-37B spaceplane lands at NASA's Kennedy Space Center Shuttle Landing Facility in Florida, after spending a record-breaking 26 months in orbit. The Orbital Test Vehicle, a reusable and unmanned spacecraft, has just completed its fifth mission.

You might be forgiven for thinking the statement above is set in the future, but this actually happened last October. The Boeing-designed X-37B was designed to last only 270 days aloft, yet it managed an incredible 780 days in orbit, and is set to launch on its sixth mission in 2020. Importantly, this is an unmanned vehicle, which may limit its utility in some respects. However, its endurance is clearly not restricted by human considerations.

We are all increasingly dependent on space-based services, whether it be communications, navigation or timing synchronisation, and the huge growth of commercial space businesses is indicative of this trend. Significantly, this expansion is through non-traditional, and often 'disruptive', means: SpaceX, Google, Amazon and OneWeb are the new kids on the space block, and they have both huge ambition and, in some cases, deep pockets. Their entry into the space market is driving down costs while driving up coverage and



Above: An artist's impression of a future satellite-launching spaceplane powered by Reaction Engines' SABRE - Synergetic Air Breathing Rocket Engine. Capable of propelling both high-speed aircraft and spacecraft, SABRE engines combine the fuel efficiency of a jet engine with the power and high-speed ability of a rocket. They are capable of Mach 5.4 in air-breathing mode, and Mach 25 in rocket mode for space flight. Reaction Engines Below: The USAF's X-37B Orbital Test Vehicle Mission 5 successfully lands at NASA's Kennedy Space Center Shuttle Landing Facility on October 27, 2019. The secretive X-37B OTV is an experimental test programme to demonstrate technologies for a reliable, reusable, unmanned space test platform for the USAF. The fifth mission had launched on September 7, 2017, from Cape Canaveral Air Force Station, Florida, on board a SpaceX Falcon 9 booster. USAF

"The militarisation of space is already under way and the question is how far it will be allowed to evolve or become increasingly lethal, either through the attacking of each other's systems or the weaponisation of space vehicles."



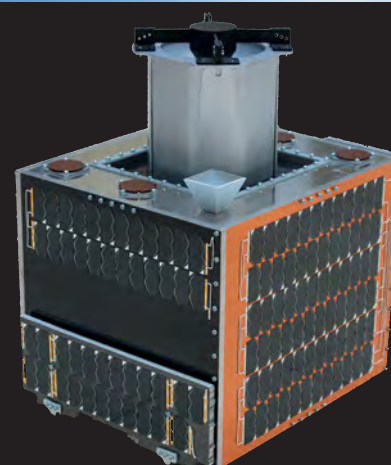


Last July, the UK Ministry of Defence confirmed that the RAF had seconded a member of staff to the Virgin Orbit programme. Virgin Orbit is undertaking pioneering research into launching small satellites into space from the wing of a Boeing 747. The same month, Virgin Orbit completed a landmark 'drop test' of a rocket at 35,000ft to confirm the separation of the rocket and aircraft during launch. Virgin Orbit

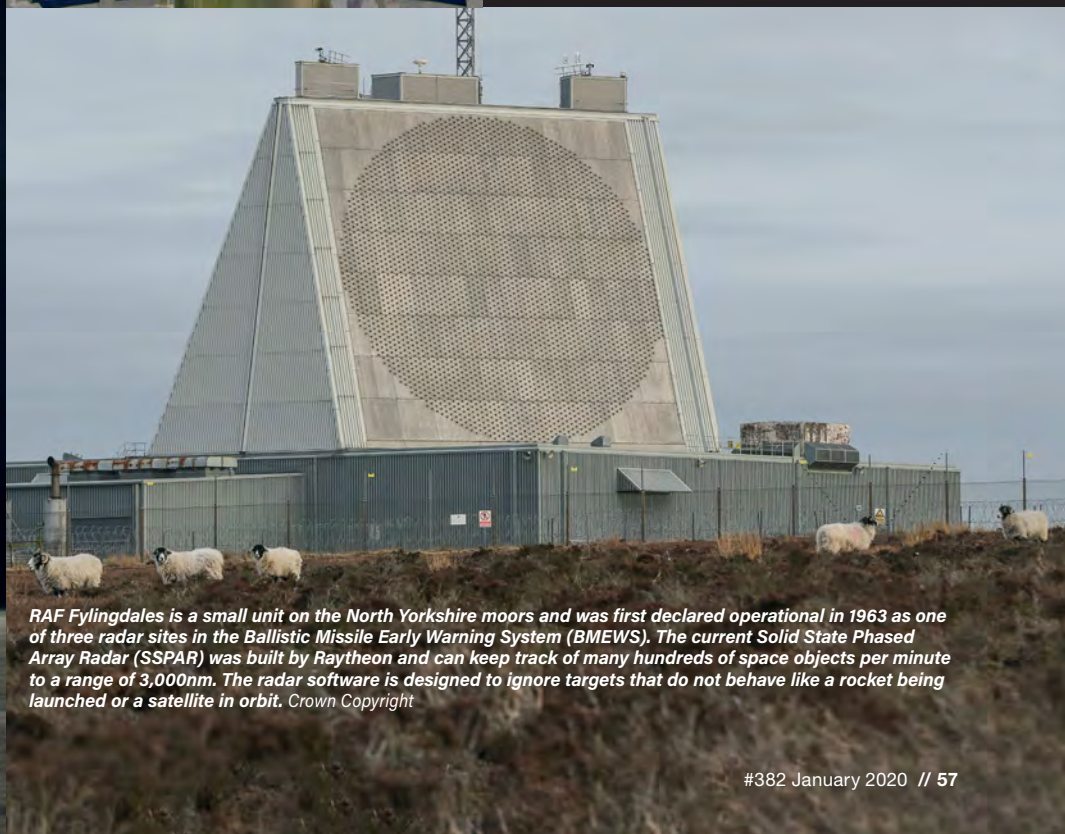
bandwidth; bandwidth that is pushed now by the demands of video streaming and gamers rather than defence requirements. Space was once the preserve of ambitious governments and highly secretive military programmes. Today, the consumer rules.

But why should we be discussing space in AFM? Well, there are two primary reasons. First, air power, like all forms of military might, is both dependent on and shaped by space power. Second, space is a very logical and coherent extension of air power, where the key qualities of perspective, reach and speed apply to an even greater degree as altitude above the Earth's surface increases. Notwithstanding the recent changes in US policy for military ownership of space, here in the UK it is most definitely under the leadership and guidance of the air force.

So what are the primary reasons for space becoming an important domain for militaries? The truth is that much of it is not new, but merely becoming more critical – and increasingly contested between peer competitors. Surveillance, positioning and communications remain the primary and decisive capabilities that space assets deliver. The 'long stare' and 'long loiter' of satellites make them the ideal vehicles for providing the



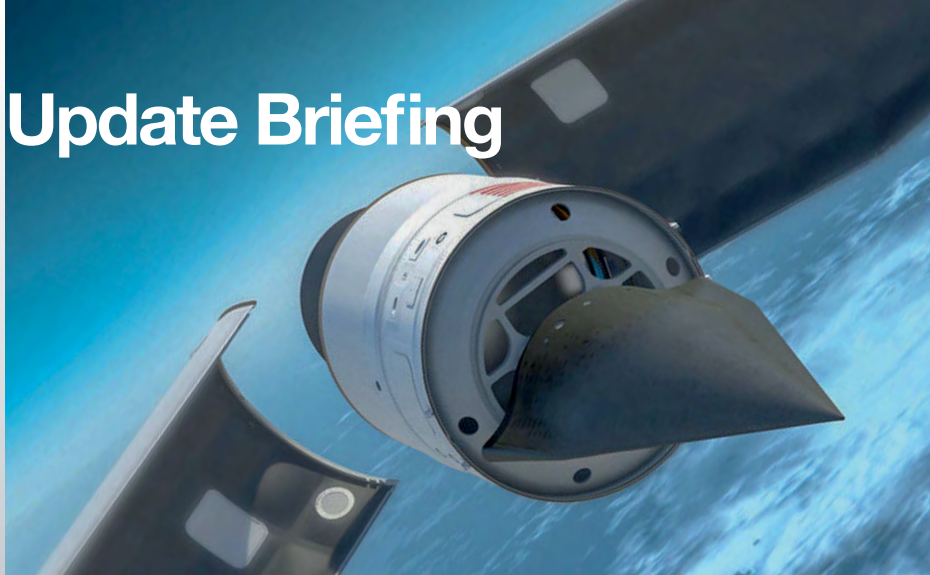
Above: The UK's Carbonite-2 satellite carries a telescope and HD video camera, both adapted for a space environment and intended to deliver video directly into the cockpit of a fighter aircraft. The RAF has collaborated with the MOD, the Defence Science and Technology Laboratory and UK industry on the programme that will provide high-quality imagery and 3D video footage from space. Crown Copyright **Left:** The X-37B Orbital Test Vehicle waits in the encapsulation cell of the Evolved Expendable Launch vehicle at the Astrotech facility in Titusville, Florida, in April 2010. Half of the Atlas V payload fairing is visible in the background. The Atlas V rocket was used to launch the OTV into space for its first four missions. USAF



RAF Fylingdales is a small unit on the North Yorkshire moors and was first declared operational in 1963 as one of three radar sites in the Ballistic Missile Early Warning System (BMEWS). The current Solid State Phased Array Radar (SSPAR) was built by Raytheon and can keep track of many hundreds of space objects per minute to a range of 3,000nm. The radar software is designed to ignore targets that do not behave like a rocket being launched or a satellite in orbit. Crown Copyright

Commander's Update Briefing

Right: An illustration depicting the Defense Advanced Research Projects Agency's (DARPA's) Falcon Hypersonic Test Vehicle as it emerges from its rocket nose cone and prepares to re-enter the Earth's atmosphere. DARPA conducted two test flights of the vehicle; in the second, in 2011, the HTV reached a speed of Mach 20 before losing control. These will likely inform technologies for the Pentagon's Prompt Global Strike programme. **DARPA Below:** The final flight of the X-51A happened on May 1, 2013, and was the most successful in terms of meeting experiment objectives. The cruiser travelled more than 230nm in just over six minutes, reaching a peak speed of Mach 5.1. Four examples of these hypersonic, unmanned, autonomous flight-test demonstrators were built for the USAF. USAF/Mike Cassidy



intelligence and connectivity that new-generation systems need. And intelligence is more and more about what is 'in space' rather than what is on the Earth's surface, whether it be other space vehicles or objects that are transiting through, such as long-range missiles. For example, as we see the proliferation of longer-range and faster hypersonic weapons, it may be only space surveillance that is capable of their detection or tracking.

The generation game

In terms of conventional, air-breathing warplanes, much is made of fifth- or sixth-generation platforms, and their use of sensor fusion, data exchange and sophisticated targeting techniques. What is not emphasised is their absolute reliance on the connectivity and information that space provides. In fourth-generation conflicts, the calculus was whether your conventional forces could out-reach and out-last those of your foes. It was a war

of attrition where the physics was dominated by mass, line of sight and sustainability, and where targeting was all about guiding your weapon to a target you could see and track. Now, space-based capabilities can provide 24/7 surveillance, data links over thousands of miles and weapon guidance accuracy that can be measured in inches. Of course, these advances are all welcomed by militaries who are looking to deliver increased lethality over greater distances, but that very dependence on space also becomes a vulnerability. What we are seeing is an increasing focus on the resilience and protection of space assets, at the same time as seeking ways to hold those of an adversary at risk.

So space is now a natural extension of the battlefield – it's now frequently referred to as battlespace. This article is too brief to address the implications of the militarisation of space, but

it is already under way. The question is how far will it be allowed to evolve or become increasingly lethal, either through the attacking of each other's systems or the weaponisation of space vehicles?

Bending the cost curve

Significantly, we are now seeing a shift in the cost of space exploitation. Not so long ago, a military space satellite would have been a limited and expensive programme, which by virtue of its cost and return on value would have been planned to last for five to ten years or more. However, once launched, its ability to keep pace with technological advances would be near impossible, thus it would be obsolete long before it ran out of fuel. Today, multiple miniature satellites can be launched simultaneously relatively cheaply from reusable launch vehicles. This has two distinct advantages for militaries: a lower cost allows for increased redundancy, and the rapid refresh rates allows them to deploy with the latest technology.

This also means that space has become highly congested and modern society is almost wholly dependent upon it. The dichotomy now is that while space has never been more readily accessible and cost effective, our reliance on it has made it a tempting target. It seems certain that the next decade will not only see a huge rise in the importance of space, but also see it coming under threat as nations continue to seek an advantage in the battlespace. The real Star Wars may be closer than you think. **AFM**

NEXT MONTH: Airborne nuclear weapons

Right: A Falcon 9 rocket launch at Cape Canaveral Air Force Station, Florida, last November 11. The launch, supported by the 45th Space Wing, included upgrades to the Starlink broadband network. The Starlink network is a collection of satellites being used to provide fast, reliable internet to areas with little to no connectivity. USAF/Airman 1st Class Zoe Thacker



Above: The Israel Missile Defense Organization and the US Missile Defense Agency conducting a flight test with the Arrow-3 Interceptor missile last July. Flight Test Arrow-01 demonstrated the Israeli Arrow system's ability to conduct a high-altitude hit-to-kill engagement. Target missiles were successfully destroyed during interceptor tests at the Pacific Spaceport Complex-Alaska in Kodiak.

COMBAT AIRCRAFT

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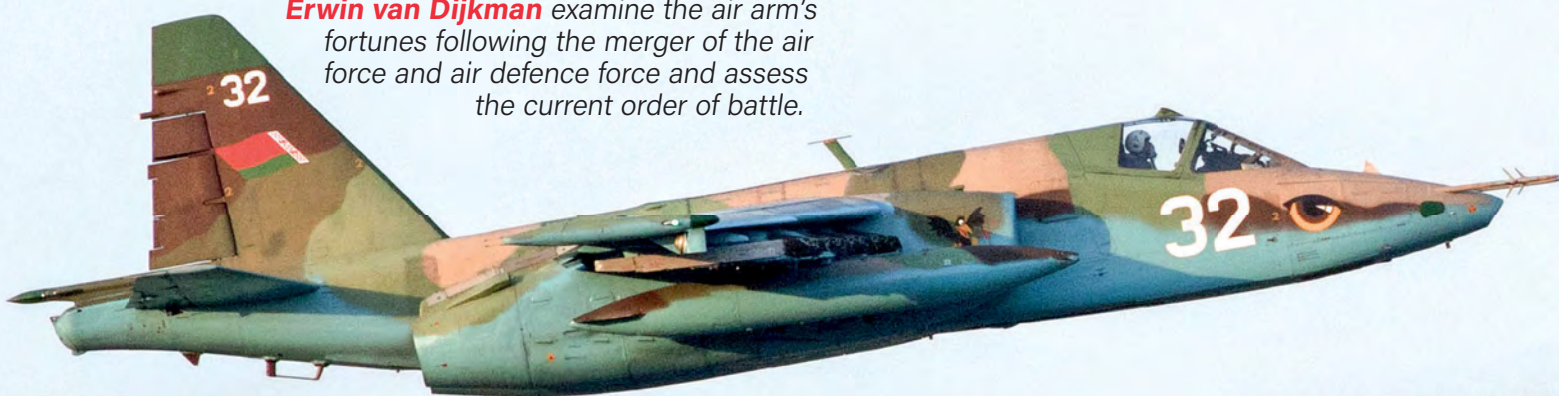


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Air power

In the last of a two-part feature on the Belarusian Air Force and Air Defence, **Patrick Roegies, Stefan Goossens** and **Erwin van Dijkman** examine the air arm's fortunes following the merger of the air force and air defence force and assess the current order of battle.



On December 21, 2001, the Air Force (VPS) and the Air Defence Forces (VSPA) of Belarus were merged into a unified air defence force – the Belarusian Air Force and Air Defence (VPS i VSPA in Belarusian, or VVS i VPVO in Russian). Early the following year saw the creation of two operational tactical commands (OTC), the Western and the Northwestern, which paralleled the OTCs of the ground forces; each was apparently assigned one fighter aviation base. At the end of 2002, the 61st Fighter Aviation Base was under the Western OTC, while the 927th Fighter Aviation Base was under the Northwestern OTC. The HQ of the Western OTC was based at Baranovichy, which covered the western and southern parts of Belarus, and the HQ of the Northwestern OTC was at Machulishchy, covering the northern, central and eastern parts of the country. The remaining aviation bases were

apparently directly subordinated to the VPS i VSPA Command.

The air force structure itself did not change and the remaining operational air bases as of the 2001 merger were as follows:

The reformed VPS i VSPA inventory included Su-24M/MR, Su-25/UB, Su-27P/UB, MiG-23MLD/UB, MiG-29/UB, Il-22, An-12, An-26, An-24, Il-76MD, Tu-134, Tu-154, Mi-24,

Mi-8, Mi-6 and Mi-26 aircraft. Some of these, although listed among the air bases' inventories, were undergoing overhaul, in storage due to a lack of spare parts, or (like the MiG-23) had been simply withdrawn from service. Most of the transport aircraft had been withdrawn and soon found their way to private or state companies and many fighters were sold abroad.

Between 2001 and 2015, the VPS i VSPA was subject to continuous and significant changes. In 2002, the 65th Combat Transport Helicopter Base at Kobryn was reorganised into the 65th Independent Mixed Helicopter Squadron before being disbanded the following year and its assets transferred to other units. The Mi-8MT combat transport helicopters and Mi-8 electronic warfare variants were transferred to the 181st Combat Helicopter Base at Zaslavichy (Pruzhany). Two Mi-26s were transferred

Belarusian Air Force and Air Defence 2001

Unit	Location	Type
13th Independent Helicopter Squadron*	Babruysk	Mi-8
50th Transport Aviation Base	Machulishchy	An-12, An-24, An-26, Il-76, Il-22, Tu-134
61st Fighter Aviation Base	Baranavichy	MiG-29, Su-27
65th Combat Transport Helicopter Base	Kobryn	Mi-8, Mi-26
116th Bomber Reconnaissance Aviation Base	Ros	Su-24
181st Combat Helicopter Base	Zaslavichy (Pruzhany)	Mi-8, Mi-24
206th Assault Aviation Base	Lida	L-39, Su-25
248th Independent Helicopter Squadron for Special Assignments	Minsk-Lipki (also known as Minsk-Stepyanka)	Mi-8, Mi-26
276th Combat Helicopter Base	Baravitsy (Baravukha-1)	Mi-8, Mi-24
927th Fighter Aviation Base	Osovtsy (Byaroza)	MiG-29

* Formed in 1994 as the 13th Independent Helicopter Squadron for Combat Control and equipped with airborne command posts variants of the Mi-6 and Mi-8. It was disbanded in 2002 and all stored Mi-6s were scrapped in situ, while its Mi-8s were redistributed among other units.

Power *Between Russia and the West*



Above: A pair of single-seat Belarusian Su-25s – '21 White' and '32 White' – take part in a military parade over Minsk last July 3, celebrating 75 years since the country was liberated from Nazi occupation. The future of the 'Frogfoot' is unclear; there's currently no modernisation programme for the remaining fleet and no replacement aircraft has been selected. Tom Feline
Below: The first two Su-30SM fighters, '01 Red' and '02 Red'; arrived at Baranavichy air base in November 2019. According to the original contract, deliveries of the 12 jets were due to commence in 2018 but were delayed due to a lack of foreign components, supplies of which were hampered by Western embargo. Belarus MoD



to the Ministry of Emergency Situations based at Minsk-Lipki and the remaining examples of the type were transferred to the 50th Mixed Aviation Base at Machulishchy. The latter was created on August 30, 2002, from the previous 50th Transport Aviation Base – it took

over the equipment and personnel from the 248th Independent Helicopter Squadron for Special Assignments at Lipki, which was disbanded the same year.

On February 23, 2002, the 276th Combat Helicopter Base was disbanded and its assets

transferred to the 181st Combat Helicopter Base, some of the helicopters being cannibalised to keep the remaining fleet in operational condition.

With a shortage in training capacity, the first two L-39C trainers were delivered in

December 2005 from the Chuhuyiv Aircraft Repair Plant in Ukraine; another three were delivered the next month. Five more were handed over by the Odessa Aircraft Repair Plant in a similar timeframe. These aircraft were all ex-Ukrainian Air Force aircraft. All ten were assigned to the 206th Assault Aviation Base at Lida. Originally, Belarus had ambitious plans to acquire up to 36 L-39s, but these were eventually shelved for financial reasons.

The next reform in July 2010 led to the disbandment of the 116th Guards Radom Red Banner Assault Aviation Base at Ros, which closed down as an active airfield. The Su-24M and Su-24MR aircraft were all transferred to the 206th Assault Aviation Base at Lida, which was renamed as the 116th Guards Radom Red Banner Assault Aviation Base. The flight training squadron with ten L-39s went to form the separate 206th Flight Training Centre – a

1



1: Belarus has already explored the full combat capabilities of the Yak-130, including launches of R-73 (AA-11 'Archer') missiles against parachute targets and drops of live KAB-500Kr TV-guided bombs. The aircraft are likely equipped with the indigenous Talisman-NT twin-pod wingtip-mounted radar jamming system. Patrick Roegies **2:** Only two An-26s now remain operational within the VPS i VSPA. At least one - EW-007DD, the sole An-26AFS aerial survey and photography aircraft - was overhauled in Rostov in late 2010 and was redelivered to Belarus in summer 2011. Patrick Roegies **3:** While new Mi-8MTV-5 helicopters have been delivered to overhaul the rotary fleet, the number of aircraft to be acquired remains unclear. This example, '87 White', is equipped with the L-370E8-6BV Vitebsk self-defence suite. This consists of four UV warning sensors fitted at the tips of the weapons outriggers, three directional IR jammers, plus flare launchers. Patrick Roegies

Aircraft sales

On gaining independence, Belarus inherited enormous quantities of military equipment from the former Soviet Union, including aircraft and helicopters. These were not only surplus to its own needs and - more importantly - beyond its financial resources, but also exceeded the combat aircraft limits set out by the Treaty on Conventional Armed Forces in Europe. An agreement was quickly signed with Russia for the transfer of all aircraft surplus to its needs.

In addition to all the Long-Range Aviation units and assets that were originally based in Belarus, Moscow received additional aircraft - including MiG-25 interceptors. In 1993, these were followed by a full bomber division with three Su-24 regiments (complete units, not just the aircraft). However, the deal was not one-sided - Belarus was short of modern fighters, and in May 1993 the 787th Fighter Aviation Regiment with MiG-29s was transferred from Finow air base in Germany to Ros air base, where it was disbanded on the spot and its aircraft transferred to the two remaining fighter units at Baranavichy and Osovttsy (Byaroza). At the start of 1994 both units were fully equipped with aircraft (three full squadrons) and transformed into fighter aviation bases - the 61st (with one MiG-29 squadron) and 927th (with three MiG-29 squadrons). At this point, Belarus had a surplus of MiG-29s.

Most of the surplus assets were withdrawn from use - aircraft were sent to the 558th Aircraft Storage Base at Baranavichy, while helicopters went to the 1169th Aircraft Storage Base in Luninets. The obsolete types were earmarked for scrapping, while the newer ones were offered for sale to foreign nations.

In 1996 Belarus sold 16 MiG-29s, two MiG-29UBs (the latter being ex-Russian aircraft), ten Su-25s and eight Su-25UBs to Peru, their delivery being completed the next year.

This was soon followed by the sale of two Su-24MRs to Algeria in 1997. The same year, two Mi-24Vs were sold to Sierra Leone and two Mi-24Ps to Papua New Guinea.

In 1999, 14 MiG-23s and Su-22s - originally stored at Baranavichy - were sold to Angola. The same country also bought one Su-24M bomber the following year. Also in 1999, a contract was signed for the delivery of 31 MiG-29s and MiG-29UBs to Algeria. The delivery was completed in 2002, and also included at least six ex-Russian MiG-29UBs.

In 2000 two Mi-24P gunships were sold to Ethiopia. In 2001 three Su-25s and a Su-25UB of the 206th Assault Aviation Base were sold to Macedonia via Ukraine, as well as a Su-27P to the UK - again via Ukraine.

A year later, two Mi-24Vs were sold to the Ivory Coast. In 2003 two Su-25UBs went to the same country, followed by another sale of two Su-25s in 2004 and two Mi-8s in 2005. Also in 2005, two Mi-24s were sold to Djibouti.

In 2008, 33 MiG-23s were exported to Syria and 11 Su-25s to Sudan. In 2009 and 2010, four more Su-25s went to Sudan, while starting from 2009 Azerbaijan acquired a total of 11 Su-25s (at least one of which was a two-seat Su-25UB). In 2010, two Mi-24s went to Nigeria and one to Uganda. In 2012 one of the Su-27UBMs was sold to the UK as a 'Su-30MK2B', while one more Su-25 went to Azerbaijan.

Finally, in 2013, a batch of 12 Su-24s was reportedly sold to Sudan. However, Belarus has so far confirmed delivering only four aircraft in 2013, and no more than eight have been noted.

Most recently, in February 2019, Belarus donated a batch of four MiG-29s to Serbia. Serbia will pay for their overhaul and modernisation, which will be carried out at the 558 Aircraft Repair Plant (ARZ) in Baranavichy. **Vladimir Trendafilovski**

Belarusian Air Force and Air Defence 2010

Unit	Location	Type
50th Mixed Aviation Base	Machulishchy	An-26, Il-76, Mi-8, Mi-26
61st Fighter Aviation Base	Baranavichy	MiG-29/MiG-29UB, Su-27P, Su-27UB
116th (Guards) Assault Aviation Base	Lida	Su-24M/Su-24MR, Su-25, Su-25UB
181st Combat Helicopter Base	Zasimavichy (Pruzhan'y)	Mi-8, Mi-24
206th Flight Training Centre	Lida	L-39C
927th UAV Training Centre*	Osovttsy (Byaroza)	Irkut-3/Irkut-10 UAV

* Directly subordinated to the Belarus Armed Forces General Staff, and not officially an air force unit.

separate unit that subsequently merged with the 116th.

On August 24, 2010 the 927th Fighter Aviation Base at Osovttsy (Byaroza) was re-formed as the 927th UAV Training Centre of the Armed Forces General Staff; it received Irkut-3 and Irkut-10 drones the following year. Its MiG-29s and MiG-29UBs were transferred to Baranavichy, the non-upgraded *Fulcrums* being flown until their operational hours were expended, after which they were withdrawn

from use and stored at the base.

The VPS i VSPA was now operating from five remaining air bases (see table above).

In 2010, the first eight Su-24s were withdrawn from use. In February 2012, the remaining 34 Su-24Ms and Su-24MRs were also retired due to high operating costs. The aircraft were moved to the 558th Aircraft Storage Base at Baranavichy and eight were later confirmed transferred to Sudan (see Aircraft sales).



2

DOSAAF

The Voluntary Society of Assistance to the Army, the Air Force and the Navy of the Republic of Belarus (DOSAAF) is very active and provides aviation enthusiasts with the opportunity to obtain a flying licence and engage in sports and flying activities. The

DOSAAF is organised regionally and makes use of six airfields: Babruysk-Syckava, Brest, Mogilev-Novaja Pasjkava, Minsk-Lipki, Rahachow and Vitebsk-Novakukavyachyna. Each facility offers different specialisations including gliding or parachuting.

The DOSAAF operates An-2, Mi-2, Yak-52, Yak-55 and PZL Wilga 35A aircraft and Jantar and Blanik gliders. While airfields are fairly busy in the summer months, the Yaks, Wilgas and gliders are kept in storage over winter.



The DOSAAF base at Minsk-Lipki operates various Mi-2 helicopters including EW-029AO in Belarusian national colours. The fleet of aircraft was largely inherited from the Soviet era, but is kept in good condition. Patrick Roegies

In December 2012, in a surprising move, the 17 Su-27Ps and four Su-27UBMs were also stood down: these were the force's most recently acquired and capable fighters. Thereafter, the MiG-29 became the primary air defence fighter. The Su-27s had been due for a lifetime extension programme including several systems upgrades, but the budget was lacking.

With yet another significant reduction of the operational inventory, in autumn 2014 the existing structure of Northern and Northwestern OTCs was disbanded.

Refurbishment and modernisation programmes for the MiG-29 and Su-25 were begun by the 558 Aircraft Repair Plant (ARZ) at Baranavichy and, in April 2014, two Su-25UB trainers upgraded to Su-25UBM standard were redelivered. Eight MiG-29s brought up to MiG-29BM standard

had been returned to service by November 2015, together with three modernised MiG-29UBM trainers. A handover ceremony took place at Baranavichy on December 1, 2015.

The overhauled *Fulcrums* received a cockpit video system to record in-flight parameters and gained the ability to use RVV-AE (R-77, AA-12 *Adder*) and R-27ER/ET (AA-10 *Alamo*) medium-range air-to-air missiles, as well as guided bombs. The fighters were also equipped with an indigenous *Satelit* self-protection jammer.

On November 1, 2014, the 206th Flight Training Centre was integrated within the 116th (Guards) Assault Aviation Base.

An initial batch of four Yak-130 trainers were purchased in 2011 and delivered in 2015. On May 29, 2015, another combat training squadron was formed, equipped with newly delivered Yak-130s. The second batch was delivered on November 23, 2016,

and the third consignment of four aircraft was handed over last May 11. Currently, the L-39s operate alongside the Yak-130s and at least two of the *Albatros* were overhauled in Ukraine in 2015-16.

In November 2015, the 181st Combat Helicopter Base was disbanded, and its helicopters transferred from Zaslavichy (Pruzhan) to Machulishchy to be integrated in the 50th Mixed Aviation Base. The changes also included formation of a third squadron equipped with around 18 Mi-24s and six Mi-8s, plus 12 additional crews.

The number of fixed-wing transports was also reduced significantly. Only two Il-76s remain operational today, of which at least one was overhauled at the 360 ARZ at Zhukovsky, Russia, where work was completed in December 2016. There are also only two surviving operational An-26s; at least one was overhauled in Rostov, Russia, in 2010.

A squadron of An-2s was inherited at Borovtsy and used for paratrooper training for airborne troops. These biplanes appear to have been withdrawn from use relatively soon after independence and the unit disbanded in the early 1990s.

Due to the reorganisations between 2001 and 2014, aircraft numbers were decreased significantly. All aircraft withdrawn from use were sent to the main storage facility or prepared for sale to foreign customers.

Local upgrades

In April 2014, it was announced that all future modernisation and upgrade programmes for the VPS i VSPA were to be undertaken domestically. The same year, Belarus teamed up with the Ukrainian company Motor Sich to develop the Mi-8MSB modernisation programme. An initial batch of five Mi-8s were



1: A modest number of 'Hinds' have been upgraded by the Orsha ARZ. However, the current status of the Mi-24V fleet remains unclear. While at least a pair each of the Mi-24K, Mi-24P and Mi-24R variants are all flying with the 50th Mixed Aviation Base at Machulishchy, the older Mi-24Vs are probably in storage. Patrick Roegies **2:** The 558 ARZ has undertaken refurbishment and modernisation programmes for the Su-25 and MiG-29. In April 2014, a pair of upgraded two-seat Su-25UBM trainers - '83 White' and '84 White' - were redelivered to the VPS i VSPA and assigned to the 116th Guards Assault Aviation Base at Lida. Patrick Roegies **3:** The 927th Fighter Aviation Base at Osovtsy (Byaroza) was disbanded in 2010 and all remaining active MiG-29s concentrated at the 61st Fighter Aviation Base at Baranavichy. During the past decade only a handful of these aircraft have been put through an extensive overhaul programme to keep the survivors operational. With the arrival of the Su-30SM, the remaining 'Fulcrums' are likely to be withdrawn. Patrick Roegies



1

Ministry of Emergency Situations

The Ministry of Emergency Situations of Belarus (MChS) has its own fleet of aircraft. Most notable is the Mi-26 helicopter, which the MChS kept operating after the air force had withdrawn the type. The *Halo* is often used for heavy-lifting and firefighting tasks, including abroad. Other aircraft include a diminishing fleet of An-2s and Mi-2s, a handful of Il-103 trainers, plus AS355NP and Mi-8MT helicopters. The AS355s were formerly operated by the Border Guards. The main MChS base is at Minsk-Lipki, co-located with the DOSAAF unit that moved here from Minsk-Baravaya. Another important hub is at Vitsyebsk-Uskhodni.

brought up to this standard. Another ten were planned to undergo the upgrade and work began the same year at the Orsha Aircraft Repair Plant (ARZ) in co-operation with Motor Sich.

A modest number of Mi-24s have also been upgraded at Orsha ARZ, where a Mi-24R was flight tested with TV3-117VMA-SBM1V-02 engines manufactured by Motor Sich. Flight tests were also conducted with a Mi-24V equipped with TV3-117VMA-SBM1V engines from the same company. The re-engined Mi-24V demonstrated significantly improved performance, including speed and rate of climb.

There were also further plans to modernise Mi-2s to the MSB-2 standard, again with support from Motor Sich. The military version, designated MSB-2MO, was

envisaged in three sub-versions: anti-tank, reconnaissance and ship-based. However, on May 15, 2018, a criminal case was initiated against the former general director of the Orsha ARZ and Motor Sich officials. The board of directors was fired, Orsha ARZ returned to state control and the Mi-8MSB and MSB-2 projects were cancelled.

Instead, the Belarusian government decided to purchase new helicopters and withdraw the ageing Mi-8s that were in need of overhaul. On June 16, 2015, Russian Helicopters announced that a contract had been signed with the Belarusian defence ministry for delivery of 12 Mi-8MTV-5 helicopters between 2016 and 2017. At least two were delivered on October 19, 2016, with the remainder arriving by the following April 11.

Current order of battle

Today, the VPS i VSPA operates from three remaining active air bases. These are Baranavichy, Lida, Machulishchy, while the recently acquired Irkut UAVs are assigned to the 927th UAV Training Centre at Osovtsy (Byaroza). In addition, there are reserve air bases with no permanently based aircraft that are kept in operational condition, with on-base infrastructure and personnel.

Due to the limited availability of assets and budget, VPS i VSPA aircrew record, on average, fewer than the required 100 hours. Between 2000 and 2005, average flight hours were approximately ten to 15 hours per year, which increased to around 30-35 per year between 2005 and 2010. Since then, the figures have further increased to 70-80 hours annually.



With the introduction of the Yak-130, some expected that the L-39C's days would be numbered. However, at least two examples underwent recent refurbishment in Ukraine, suggesting at least a portion of the Albatros fleet will remain in active service for the time being. Patrick Roegies

2

Belarusian Air Force and Air Defence 2019

Unit	Location	Type
50th Mixed Aviation Base	Machulishchy	An-26, Il-76, Mi-8, Mi-24
116th Guards Assault Aviation Base	Lida	L-39, Yak-130, Su-25
61st Fighter Aviation Base	Baranavichy	MiG-29
927th UAV Training Centre*	Osovtsy (Byaroza)	Irkut-10 UAV

* Directly subordinated to the Belarus Armed Forces General Staff.

The VPS i VSPA took delivery of its first pair of Su-30SM multi-role fighters in November (see Russia & CIS, p20). Currently, 12 Su-30SMs are on order and deliveries are expected to be completed by 2021; these will likely replace the ageing MiG-29s. According to unconfirmed sources, around 11 MiG-29s are still in operational service and their remaining lifetime will mainly depend on the cost per hour compared with the new Su-30SM.

In the last decade, Russia has submitted several requests to use

at least one forward air base on Belarusian territory. In 2013, the Russian defence minister Sergei Shoigu announced plans to forward deploy military aircraft in Belarus and a detachment of Su-27s from Besovets was temporarily based there in December 2013. In January 2018, several media reports in Russia and Belarus stated that a Russian Aerospace Forces regiment previously intended to be based in Belarus would instead be located in Russia's western exclave of Kaliningrad.

Conclusion

Integration of the Su-30 within the VPS i VSPA will considerably enhance its capabilities and provide an effective complement to ground-based air defence systems such as the S-300, S-400, Buk-M2 and Tor.

The future of the Su-25 remains unclear. There are currently no modernisation plans for the remaining fleet of aircraft and no replacement aircraft has been specified.

Examples of the Mi-24P, Mi-24K and Mi-24R are all still flying with the 50th Mixed Aviation Base at Machulishchy. At least two of each variant are operational, having been noted flying in the last few years after recent overhauls.

The older Mi-24Vs are

probably in storage.

A large number of Mi-8s have also recently been noted stored at the same base. As of 2019, the air arm listed four Mi-26s on strength.

While Belarus has repeatedly refused to provide Russia with an air base within its borders, it remains in Moscow's interest to strengthen the VPS i VSPA's ability to defend its airspace – and thus prevent possible adversaries from attacking Russia through Belarusian territory.

In future, aircraft replacements and modernisation programmes will depend on the availability of sufficient funds, which will likely remain hard to come by in the short term at least. **AFM**

3



Open Day at Tainan

The open day at Tainan Air Base on October 19 was the only event of its kind to take place in Taiwan for 2019, after bad weather forced the cancellation of the open house planned for Hsinchu AB in August. AFM contributor **Dietmar Fenners** reports from Tainan.



Above: F-CK-1D serial 1624 (87-8101) from the Tainan-based 1st TFW's 1st TFG was displayed with an example of the Wan Chien (Ten Thousand Swords) standoff cruise missile produced by the military-run Chung Shan Institute of Science and Technology (CSIST). This GPS-guided weapon has a 155-mile (250km) range and can hit targets on the Chinese mainland when launched from above the Taiwan Strait. Even though the missile has been known about since 2011 and was publicly displayed in 2014, its development has made slow progress due to political constraints. **Left:** Another specially marked jet in the flying display was this Mirage 2000-5Ei from the 2nd TFW. Serial 2020 received these colours back in 2017 to celebrate 20 years of service for the type in the ROCAF. The three Taiwanese Mirage groups – the 41st and 42nd TFGs and the 48th Training Group – are all based at Hsinchu. Taiwan acquired 48 Mirage 2000-5Ei and 12 Mirage 2000-5Di fighters. The US\$4.9bn deal was signed in November 1992 and also included delivery of 960 Matra MICA medium-range and 480 Magic 2 short-range AAMs.



Left: F-16A Block 20 serial 6635 (TA-35, FMS 93-0736) from the 22nd TFG/4th TFW at Chiayi AB was among the aircraft that performed a solo flying demonstration. The special markings were applied in 2017 to mark the 80th anniversary of the ROCAF. The Chiayi wing includes three tactical fighter groups – the 21st, 22nd and 23rd TFGs – which began to receive aircraft upgraded to F-16V standard in October 2018. The ROCAF is the world's first F-16V operator and the majority of upgraded F-16s will equip the 4th TFW at Chiayi and the Hualien-based 5th TFW. **Below:** F-16A Block 20 serial 6677 (TA-77, FMS 93-0778) flown by the 26th TFG/5th TFW stationed at Hualien. While most of the ROCAF's air combat fleet is assigned to wings located on the west coast, the 5th TFW is the exception, since Hualien is located on the east of the island. The base is home to the wing's 17th, 26th and 27th TFGs flying Fighting Falcons, plus the 12th Tactical Reconnaissance Squadron operating a mix of F-16s, RF-5Es (seven low-hour F-5Es that were converted to Tigereye reconnaissance standard by Singapore Technologies Aerospace) and two-seat F-5Fs.



Left: Tainan AB is home to the Republic of China Air Force's (ROCAF's) 1st Tactical Fighter Wing (TFW), formed of three tactical fighter groups: the 1st, 3rd and 9th TFGs, all flying the F-CK-1 Hsiung-Ying (Brave Hawk). The 1st TFW was the second wing to receive the F-CK-1 and completed transition in early 2000, when the final production examples arrived at Tainan from the Aerospace Industrial Development Corporation (AIDC). The morning of the open day started with the take-off of seven F-CK-1C/Ds from the 1st TFW, including two spares; five took part in the opening fly-by. **Right:** ROCAF P-3C serial 3310 (c/n 5581, BuNo 158572) wearing the bat insignia of 34 Squadron, which serves under the Maritime Group at Pingtung. A contract for the overhaul and upgrade work of 12 former US Navy Orions was awarded to Lockheed Martin in March 2009. The first aircraft was originally scheduled to be delivered in 2012, but this was delayed by a year, with the first upgraded example returning to the air in July 2012. The first of the ROCAF's refurbished Orions arrived at Pingtung in September the following year and was inducted into service in October. The final example was delivered in July 2017.



Serial 1427 (84-8045) is a single-seat F-CK-1C that also wears 80th anniversary markings. This aircraft is from the ROCAF's other Hsiung-Ying operator, the 3rd TFW at Ching Chuan Kang AB. The 3rd TFW is responsible for the 7th and 28th TFGs flying the F-CK-1C/D. This was the first wing to receive the F-CK-1, converting to the type between November 1993 and early 1997. While the initial 71 upgraded F-CK-1C/Ds were delivered to the 1st TFW at Tainan, phase two of the modernisation programme covered the retrofitting of the remaining 56 F-CK-1s. Work began in 2014 and was completed in December 2017, when the final Hsiung-Ying was assigned to the 3rd TFW at Ching Chuan Kang. All photos Dietmar Fenners

The Arctic t

The 139th Airlift Squadron – part of the New York Air National Guard's 109th Airlift Wing – is probably the only flying unit that operates at opposite ends of the world. The wing supports research activities in both polar regions, two of the most inhospitable areas on the planet. **Rogier Westerhuis** travelled to Greenland to learn more about this unit's unique challenges and mission.



Created in 1948 as a fighter squadron, the 109th continued in this role until 1960, when the C-97 Stratofreighter was introduced and the unit shifted to a global transport mission. The unit became the 109th Air Transport Group, receiving its first C-130A in April 1971. Renamed the 109th Airlift Wing (AW) in October 1995, it still flies the Hercules from Stratton Air National Guard Base, Schenectady, New York state.

An air force presence in the polar region dates back to the mid-1950s. The Distant Early Warning (DEW) Line, with its string of radar sites stretching from Iceland through Greenland, Canada and Alaska, was constructed to detect Soviet bombers during an attack over the Arctic. Two of the four DEW sites in Greenland – DYE-2 and DYE-3 – were located high on the ice sheet and only accessible by air. Originally the task of delivering personnel and goods was assigned to the 17th Tactical

Airlift Squadron, based in Alaska, but in 1975 responsibility was transferred to the 109th AW and its 11 C-130s. Five were equipped with skis and designated C-130D. Eventually, new satellite technology and the end of the Cold War led to the closure of Greenland's DEW sites and the last flight to DYE-3 in December 1989 marked the end of this mission.

A new priority

In 1984, the ageing C-130As and Ds had been replaced by eight new C-130Hs, four of which were equipped with skis and designated LC-130H. Today the wing has 12 C-130s, ten 'Skibirds', of which four are owned by the National Science Foundation (NSF), and two standard C-130Hs, referred to as 'Wheelbirds'.

When the DEW Line mission ended, the wing lost its main tasking and instead began to support the NSF, a role that expanded drastically in the 1990s. Today, though technically part of the US Department of Defense, the wing's main duties revolve around the NSF, which funds operations



Above: The patch used by crews of the 139th Airlift Squadron, part of the New York Air National Guard's 109th Airlift Wing. **Above right:** 'Skibird' pilot 1st Lt Emmanuel Terrazas flies into Camp Raven while being trained in polar operations. The weather on this flight was marginal, with the clouds and snowy ground blending into one. Without visual cues, crew members rely on each other's input to land the aircraft safely. This is an important part of the training. **Right:** The take-off is the most challenging part when operating off snow. Conditions can vary greatly, which impacts the friction caused by the skis and, with that, the take-off performance of the aircraft – in this case, LC-130H 83-0491 'City of Albany'. All photos Rogier Westerhuis

ransporters



in both the Antarctic and Greenland. Training and flights that have a military purpose are not paid for by the NSF and are covered by the wing's own budget.

Supporting science in Greenland

From April to September the 109th deploys three or four LC-130s and around 80 airmen to Kangerlussuaq Airport (the former Sondrestrom Air Base) on two-week rotations, operating from the old fire station on the southern platform in Greenland, where facilities are basic, but sufficient. From here, the wing supports two science research camps. The first, Summit Camp, is located at 10,500ft (3,200m) on ice sheet 420 miles (676km) northeast of Kangerlussuaq. The second, EastGRIP Camp, is located 560 miles (901km) northeast of Kangerlussuaq and is

home to the East Greenland Ice-core Project, where researchers drill for ice cores samples.

The 109th transports fuel, personnel, equipment and provisions to both sites. Fuel is either carried in 55-gal (208-lit) drums or pumped out of the aircraft's own tanks into storage units by civil contractors. The wing also transports parts of the ice core from EastGRIP to the US, a delicate undertaking as changes in temperature could damage the sample.

During the 2018 summer operations in Greenland the wing flew 238 missions (146 of those were training flights at Camp Raven), transported 1.6 million pounds (725,748kg) of cargo, 67,915 gal (257,086 lit) of fuel and 780 passengers.

Camp Raven

Crews from the 109th mostly train at Camp Raven, which has a single skiway and open snow landing area and is located 7,000ft (2,134m) above sea level right next to the abandoned DYE-2 radar site 100 miles (161km) east of Kangerlussuaq. Day-to-▶



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1: The crew keeps the engines running while LC-130H 83-0490 'Pride of Clifton Park' is unloaded at Summit Camp, located on top of 10,500ft of ice, 420 miles northeast of Kangerlussuaq. Note the civilian contractor pumping fuel from the aircraft's fuel tanks. **2:** The 109th AW flies the only ski-equipped C-130s in the world. To prevent the skis from freezing to the snow, they are raised whenever the aircraft is stationary on the ice. The skis add an additional 5,000lb of weight and are unique to the LC-130H 'Skibird'. **3:** The pilot's first priority during take-off is raising the nose-ski. Once this is off the snow, a take-off is almost guaranteed, assuming there is enough skiway remaining. 'Skibirds' sometimes use rocket-assisted take-off bottles, but these are becoming obsolete with the arrival of the new NP2000 propellers. **4:** Some items are carried off by hand. Here, MSgt Francis Johnson is unloading a box of provisions from a 'Skibird' at the start of another Kool School barren land survival course. The loadmasters of the 139th AS are among the most versatile in the business - they work with a very wide variety of cargo under the most challenging conditions.

day management is the responsibility of a married American couple from Ohio. Living in isolation all summer, they make sure the skiway is maintained for flight operations and communicate weather and snow conditions to crews of incoming aircraft and flight operations at Kangerlussuaq.

Maintaining the skiway is a laborious task that can take more than 12 hours to complete. It has to be cleared of snowdrift and made as smooth as possible, a job that's become somewhat easier with the arrival of a new PistenBully snow groomer. Although the camp is run by the NSF, it's used by the 109th for currency training and to familiarise new crews

in polar operations and flying with skis. The camp is also home to the wing's annual survival course, 'Kool School' (see boxed item).

In the freezer

The NSF also conducts research in the south polar region. Operation Deep Freeze is the general term for logistical support provided by the US military to the United States Antarctic Program, managed by the NSF. Initially, aid to NSF operations in the Antarctic was provided by the US Navy's Antarctic Development Squadron Six (VXE-6). In 1988 the navy requested assistance from the Air National

Guard when some of its ski-equipped C-130s went through depot-level maintenance, leaving VXE-6 short on capacity. The 109th AW sent aircraft and staff to work alongside VXE-6.

In 1996, the 109th completely took over from the navy, a transition that started in October and took three years to complete. VXE-6's LC-130s were transferred to the 109th, which became the only operator of the type in the world. Consolidating polar flight operations ensured the US military was able to provide quick and reliable air access to both regions.

Deep Freeze normally begins with the 109th AW's arrival at McMurdo Station on the south tip of Ross Island in October and lasts until February. Most of its flights are in support of Amundsen-Scott South Pole Station, one of the NSF's three year-round research stations. During the 2018-19 season, the wing completed 154 missions, flying an estimated 2,100 researchers and support staff, plus around 250,000 gal (946,353 lit) of fuel and 2.8 million pounds (1,270,059kg) of cargo to research stations around the continent.

'Herbies'

With more than 7,500 hours, mostly on C-130s, 109th AW pilot Lt Col Tom Esposito offered AFM this insight: "Flying in Antarctica is more challenging because the weather is even more unpredictable [than the Arctic] and meteorologists have fewer tools to produce

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'Kool School'

The extreme polar environment makes any aircraft incident potentially deadly. With help from survival instructors from Eielson Air Force Base, Alaska, the 109th's Aircrew Flight Equipment branch – part of the 109th Operations Support Squadron – created the Barren Land Arctic Survival Training, better known as Kool School. In the early days, only aircrew

went through Kool School, but now any personnel that could find themselves stranded in this type of environment are offered the course. The syllabus includes two days in a classroom followed by two nights and three days out on the ice sheet. Students learn about building snow shelters and staying warm as well as signalling methods, the use

of survival equipment and the physical and psychological factors behind surviving in a freezing environment. Every flight in the polar region carries individual extreme cold weather survival bags with equipment for all crew and passengers.



At the end of their training, students of the Kool School survival course board a waiting 'Skibird' at Camp Raven for the short flight back to Kangerlussuaq.

a reliable forecast. If the weather suddenly changes, we have limited options to divert, so we are constantly considering our options."

The area around McMurdo is prone to sudden blizzards, locally known as 'Herbies', which might prevent a safe landing on the skiway. Lt Col Esposito continued: "Not far from McMurdo we have the whiteout area, an area of a few square miles that is surveyed yearly to make sure it is suitable for us to land on. The area gives us a safe option to land in a situation of zero forward visibility and with zero ceiling. A whiteout landing is extremely unnerving because, unlike in the commercial world where the autopilot would manage the landing, we fly it totally by hand. The role of the navigator is essential as our aim is to land with zero drift. Although we do train whiteout landings in simulators, thankfully the actual need to do it is extremely rare."

The take-off

It is more demanding flying off snow and ice than other hard surfaces and a successful take-off requires specialised knowledge. Lt Col Esposito explained: "Although the ski landing does require practice, it is relatively easy. The take-off is challenging. Snow

conditions are never the same and change with temperature, freshness, moisture content

and even the angle of the sun. In ski-missions there are no standards!"

Though the bottoms of the skis are covered in Teflon to minimise friction, their large surface area still provides a lot of resistance, which greatly deteriorates take-off performance. Because aircraft operating on skis require a longer take-off run than those on wheels, the length of a skiway can exceed 17,000ft (5,182m).

Depending on snow conditions, this length is sometimes still not enough and if take-off hasn't been achieved 2,000ft (610m) before the end of the runway, it is aborted. A take-off attempt is called a 'slide'. Lt Col Esposito: "We have to try different techniques. Sometimes we set 50% flaps, sometimes 100% and sometimes we change the flap setting during take-off. The objective is to get the nose ski in the air quickly and, assuming the remaining skiway is long enough, a take-off is almost guaranteed."

1st Lt Emmanuel Terrazas, another LC-130H pilot, added: "The centre of gravity is important, and we prefer to have it towards the rear of the aircraft."

Lt Col Esposito continued: "Weight is another consideration. More fuel gives us more endurance, but the extra weight makes it harder to take off. We sometimes use ATO [assisted take-off] bottles which gives us a boost equivalent to having a fifth engine for approximately 15 seconds. This is often enough to lift the nose ski off the snow."

Ski combat off-load

Snow conditions aren't the crews' only concern. When operating on snow, a crosswind of more than 15kts will cause the aircraft to drift too much on approach and if it exceeds 35kts it could push the aircraft off-course on the ground. These are the limits.

Furthermore, the skis can freeze on to the snow as friction causes it to melt and refreeze. To avoid this, the crew lifts the skis when the aircraft is stationary. If it does get stuck, engine power alone might not be enough to move it and some old-fashioned digging by hand could be the only option. If the risk of the aircraft getting stuck is high, the crew uses a ski combat off-load, where the cargo pallets are pushed off the ramp while the aircraft is taxiing, and the aircraft doesn't come to a complete stop.

To avoid other issues related to the freezing temperatures, the engines are not shut down when the aircraft is on the ground and personnel have to deal with the prop wash. The wind chill behind the turning props can drop the temperature to as low as -60°C.

Crew co-ordination

Landing a 'Skibird' in poor weather conditions requires great team co-ordination; each crew member in the cockpit plays an essential role. The initial approach is directed by the navigator. Bamboo flagpoles that mark the skiway have



NP2000 propeller upgrade

The 109th AW recently began upgrading its ten LC-130H 'Skibirds' with the NP2000 modular propeller system. This consists of eight composite blades that can be replaced individually for easier maintenance.

Not only are they easier to transport, the system is also more reliable. Perhaps the biggest advantage and one of the reasons why the 109th was the first unit to use this system operationally on its C-130s (the US Navy already uses it on its E-2s and C-2s), is the fact it delivers more thrust.

Lt Col Esposito explained: "The extra thrust produced by the new propellers is a real benefit during take-off. Without the support of ATO bottles it's sometimes almost impossible for us to get off the ground. Recently a 'Skibird' still equipped with the old propeller made 21 'slides'. That's a combined take-off distance of 60 miles [97km] before it finally managed to take off. With the new propeller this wouldn't have happened."

It replaces the need for ATO bottles. As part of the upgrade these aircraft are also equipped with a new electronic propeller control system (EPSC) and an in-flight propeller balancing system (IPBS), which together provide improved safety, reduced maintenance down-time and increased reliability.



Ten 'Skibirds' are being equipped with the NP2000 modular propeller system, developed by Hamilton Sundstrand. The propeller consists of eight composite blades and delivers additional thrust, which is a great advantage on skiways.

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1: LC-130H 'Skibird' 83-0493 'Pride of Scotia', still equipped with the old propellers, leaving Kangerlussuaq Airport for the six-hour flight back to its home at Stratton Air National Guard Base, Schenectady, New York. 2: The 109th AW operates from the southern ramp of Kangerlussuaq Airport, which was previously known as Bluie West 8 and Sondrestrom Air Base, but which is now under civilian control. Air transportation is the only practical way of getting everything that is needed high out on the Greenland ice sheet. 3: The LC-130 was instrumental in the construction and operations of the DYE-2 and DYE-3 radar sites on the Greenland ice sheet. Although DYE-2 was shut down in 1988, the skiway is still being used. It's now part of Camp Raven and the abandoned radome is a great visual reference point. 4: Members of the 109th Aircrew Flight Equipment branch provide support to the instructors and students of Kool School. They are the last to leave Camp Raven at the end of a course and are here seen waiting to be taken back to Kangerlussuaq.

radar-reflecting material, detected by the on-board radar and the navigator uses this data to fly a non-precision airborne radar approach. Flags form an extended centreline up to 2 miles (3.2km) from both ends of the runway.

The navigator will guide the flying pilot, constantly giving information on distance and drift. Once the navigator has guided the aircraft on to the final approach path, the co-pilot will search for the flags that form the centreline. The moment the co-pilot sees the flags and can visually guide the pilot, they will say: "Co-pilot has approach," and take over responsibility for directing the pilot from the navigator. The co-pilot will then continue to give the pilot simple instructions and guide them towards the runway.

The final approach path is relatively flat with only a 1.5° glideslope, which allows more time to make corrections. The flying pilot will continue to fly by constantly monitoring the instruments; they will not look outside to avoid disorientation. The co-pilot will call: "Continue descent," when they have identified at least three pairs of flags. The next and final step is for the pilot to switch their focus from instruments to the skiway. They will confirm: "Pilot has the skiway," and land the aircraft.

When the pilot shifts attention from inside the cockpit to outside, the co-pilot continues to monitor the instruments. Throughout the

whole approach, the navigator will carry on communicating to pass on information about height and drift while the flight engineer closely monitors the systems. Approach minima are a 300ft (91m) cloud base and forward visibility of 1 mile (1.6km).

During the weather briefing the crew also gets a surface and horizon definition. The former tells the crew whether they will be able to see the texture of the snow during the final stages of their approach, which gives them a height reference. The latter gives them an idea of how easy it is to see the horizon and provides a reference to the aircraft's attitude. The definitions are ranked from good to nil. When both are nil the crew have no visual references as the white sky totally blends in with the snow below, creating one white mass. The crew refers to it as "flying in a ping-pong ball"

Guided by stars

Navigating in the polar regions is challenging. The 'Skibirds' are equipped with a self-contained navigation system (SCNS). This is a combination of GPS, Doppler radar and an inertial navigation system (INS). But there are fewer aids here, GPS is less reliable and the effects of variation and the convergence of longitude lines both greatly affect the reliability of a standard compass.

Crews use different navigation methods to overcome some of these difficulties. Long-time



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navigator Lt Col Ron Ankabrandt explained: "Magnetic variation has a significant impact on our ability to navigate accurately in the Arctic. The magnetic north is currently somewhere on Ellesmere Island [in northern Canada], 500 miles [805km] south of the true north. Instead of using a standard compass, we use a grid system once we fly higher than 72° [latitude] north or 60° [latitude] south."

The grid system is overlaid on a navigational chart typically oriented parallel to a specified meridian of longitude. Lt Col Ankabrandt continued: "In order to fly the grid, you need to be grid qualified and our unit is probably the last unit in the world that maintains this qualification."

Navigators flying with the unit are also qualified in celestial navigation and the use of an old-fashioned sextant, an instrument that measures the angular distance between two objects to help determine a position. Though the navigator role is disappearing with technological advances, the 109th AW is likely to keep it due to the complexities of navigating in the polar regions.

An average of 40 technicians support flight operations during each two-week rotation in Greenland. There are no hangars for these technicians to work in.

Master Sergeant (MSgt) Michael Hill of the 109th Aircraft Maintenance Squadron explained:

"We have some of the hardest maintenance jobs in the air force. All our work is done outside in temperatures that often drop well below freezing. We use heat ducts to get some warmth, but our biggest safety concern is the time that someone is exposed to the weather. Hypothermia is a real risk, so we have different work/rest cycles. Work takes longer to complete. A two-hour job at home could take two days here in the Arctic, especially if we're asked to address an issue out on the ice. We've had to do engine changes in Antarctica with temperatures as low as -34°C. It's like working on top of a giant ice cube! We work in Greenland for a few months, then a few months later we are in Antarctica. We constantly chase the cold and not everyone can handle that."

Flying in the polar regions is harder on the airframe too. MSgt Hill continued: "Our aircraft fly more than most other units. Snow operations are hard on the landing gear. The skis add an additional 5,000lb [2,268kg] of weight and the terrain we fly on is rough, especially when we fly off the open snow. The landing gear requires a lot of attention and the condition of the skis' Teflon-coated base has to be checked after each mission."

Strategic benefit

Although it predominantly supports the NSF, the 109th AW keeps a military tasking too. It

regularly flies into Thule Air Base, the USAF's northernmost base on the northwest side of Greenland, as well as occasional missions into Canadian Forces Station Alert, in the Canadian Arctic Archipelago. Additionally, the wing supports North American Aerospace Defense Command (NORAD) including helping set up skiways on the open ice as part of Exercise Polar Reach. It has also supported operations in the Middle East and Asia and provided relief flights after Hurricane *Irma* struck the Caribbean in September 2017.

Climate change will have a big impact on the Arctic and is increasing the region's strategic importance (see also p80-84). Bordering countries are increasing their influence in the area and expanding their military capabilities. Although the need for ski-equipped transport aircraft almost disappeared when parts of the DEW Line were decommissioned, the USAF made the strategic decision to preserve its ability to operate in the polar regions. For the last 30 years it mainly benefited science, but in the near future this capability could well become a real strategic advantage. **AFM**

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4

Swedish tanker time

Some 20,000ft above northern Sweden, **Björn Rüdén** joins the Swedish Air Force's dedicated tanker, callsign 'Mighty 842', as Gripen pilots learn the art of aerial refuelling.

"Dalton 01, cleared wet contact right, 2,000 pounds." The voice of 'Dalton 01' belongs to a pilot of 212. stridsflygdivisionen at F 21 'Norrbottnens' flygflottilj (wing, based at Luleå) flying a JAS 39D Gripen with an air-to-air refuelling (AAR) instructor pilot in the back seat. In 2005, the Flygvapnet (Swedish Air Force)

modified one of its six remaining TP 84 (C-130H) Hercules aircraft (serial 84002/'842') with a hose-and-drogue system. The JAS 39C/D Gripens were the first Swedish aircraft fitted with refuelling probes and the Flygvapnet needed its own tanker aircraft to keep the Gripen pilots proficient in AAR. The TP 84s are flown by 731. transportflygdivisionen based at F 7 'Skaraborgs' flygflottilj (at Sätenäs) where '842' is the oldest active TP 84 in the inventory; it was taken into service in 1969 and had accumulated about 19,000 flight hours at the time of *AFM*'s visit.

The modifications to '842' included two wing refuelling pods (Cobham Mk32B-904E units), wiring and fuel pipes in the wings and windows in the jump doors. The new square windows enable the loadmasters to assist in the observer role while conducting AAR. To further assist the tanker commander (TC), two aft-looking cameras were installed to complement the 'Mark 1 eyeballs' of the aforementioned loadmasters. In the cockpit, a panel was installed above the flight engineer's seat to supervise the pods, fuel flow, etc. Two screens also show the feed



1: A loadmaster oversees the engine start-up procedure for TP 84 '842'. The tanker was deployed from Sätenäs to Luleå for the AAR campaign. **2:** Plugged into the basket, 'Wolf 12' in JAS 39C serial 39249 toting a Litening G III targeting pod and a centreline drop tank. **3:** The pilot in JAS 39C serial 39265 connects during his first contact in a single-seater. This takes place under the watchful eye of a more experienced colleague in the rear seat of JAS 39D serial 39826. **4:** Note the spinning propeller on the AAR pod - this increases the fuel pressure during transfer to a connected aircraft. The Hercules is fitted with a pair of Cobham Mk32B-904E units. All photos Björn Rüdén



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from the aft-looking cameras, supporting decision-making in the cockpit.

The receiver

Originally, the Gripen was not intended to be able to refuel in mid-air, due to the defensive nature of the Swedish armed forces' strategy, and the initial JAS 39A/B versions lacked this ability. It was not until the South African Air Force (SAAF) decided to buy JAS 39C/D versions of the Gripen that Saab developed and fitted the type with a telescopic retractable probe; the Flygvapnet opted to add it to its JAS 39C/D airframes. With only limited space available for the Saab engineers to fit the probe and other necessary modifications, the result is arguably something of a compromise. The probe is located on the left

side of the fuselage, behind the air intake, which is further back than customary.

This renders it impossible for the Gripen pilot to see if the probe has hit ▶



or missed the drogue, since it occurs outside their peripheral vision. This makes it critical that the pilot follows an established method when conducting AAR, as the instructor pilot in the rear seat of 'Dalton 01' showed his younger colleague during the first contact on the basket.

Tanker campaign

During the AAR campaign in which *AFM* took part, '842' was deployed from Sätenäs to Luleå in order to operate from the same base as the receivers and let them get as much 'air time' behind the tanker as possible. The instructor pilot, callsign 'Bullit', from 212. stridsflygdivisionen, summarised the campaign: "The main objective was to get four new pilots from our squadron qualified for AAR operations, and secondly to maintain currency for the rest of the Gripen pilots in the wing. We had four days available and quite a tight schedule. There were some issues in the beginning with tanker fallout on the first day due to a hydraulic failure, but after that it was a big success. We managed to get all four of our young pilots qualified, together with currency training for the others and some requalification for a few other pilots. I believe that '842' and her crew did the job well."

AAR operations

Despite Sweden's non-aligned status, the Flygvapnet adheres to NATO Allied Tactical Publication (ATP) 3.3.4.2, covering air-to-air refuelling, while conducting its tanking operations. This enables Swedish Gripens to refuel from other air forces' tankers, as long as the Gripen is certified for the available tanker type. The Försvarets materielverk Test och Evaluerings - Luft (FMV T&E Luft, the Swedish Defence Materiel Administration Test and Evaluation - Air) supports the process to certify the Gripen on other tanker types.

The Czech connection

Czech JAS 39C/D Gripens belonging to the 211. taktická letka (211. TL, 211th Tactical Squadron) also joined the Swedish AAR campaign. The fighters were participating in the two-week Nordic Fires missile and gunnery exercise (see *Czech jets on live-fire exercise*, May 2019, p4).

These manoeuvres were held in the vast airspace of the Vidsel test range and close to the tanker track established by '842'. Over the two days that *AFM*

joined the campaign, Czech Gripens using 'Maiden' callsigns conducted at least 20 'wet' and 'dry' contacts, providing currency training for their pilots.

It's common practice for other nations flying the Gripen to join the Swedish AAR campaigns or to buy their own 'tanker time' from Sweden. Meanwhile, Finland and Switzerland - both flying the F/A-18C/D Hornet - also refuel from the Swedish tanker.



Czech Air Force JAS 39D Gripen 9820 (c/n 39820) of the 211. TL, callsign 'Maiden 11', has its probe deployed for an air-to-air refuelling sortie with the Swedish Air Force TP 84 '842'.

Swedish Gripen squadrons often refuel from different types of tankers during exercises and other special events. A good example is the Arctic Challenge Exercise (ACE), a multinational air training mission conducted in northern Sweden, Norway and Finland. More than 140 aircraft took part in ACE 19 this year, including tanker aircraft from different countries (see *Typhoon aces*, August 2019, p10-11). "When refuelling from other tankers, like the US KC-135 or the German A310 MRTT, there is no difference regarding procedures. It's the same as on any other tanker and we use the same method or technique as when refuelling from our C-130," explained 'Bullit'.

In 2011, '842' was used in support of the Swedish JAS 39C Gripen's contribution to NATO's Operation Unified Protector

over Libya, which aimed at implementing an arms embargo, a no-fly zone (NFZ) and protecting Libyan civilians.

TP 84 '842' and the Gripens were stationed at Sigonella air base in Italy, from where the Gripens were used in a reconnaissance role with the Spaningskapsel 39 (SPK 39) and the Litening G III laser designation pod to help enforce the NFZ. To support this assignment, '842' flew tanker tracks over the Mediterranean, enabling the Gripens to conduct their tasked missions and refuel to extend combat range and endurance. **AFM**

Acknowledgements:

Thanks to 731. and 212. Divisionen and 75. FlygUhKomp for their support during preparations for this article.

'Wolf 54' in single-seat Gripen C serial 39274 during a 'wet' contact watched closely by the pilot in 'Dalton 41'.



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Building skills at Beja

Jorge Ruivo reports from the 11th iteration of Real Thaw, which featured 21 aircraft and 600 personnel, including elements from the Portuguese Air Force, as well as the army, navy and foreign nations.

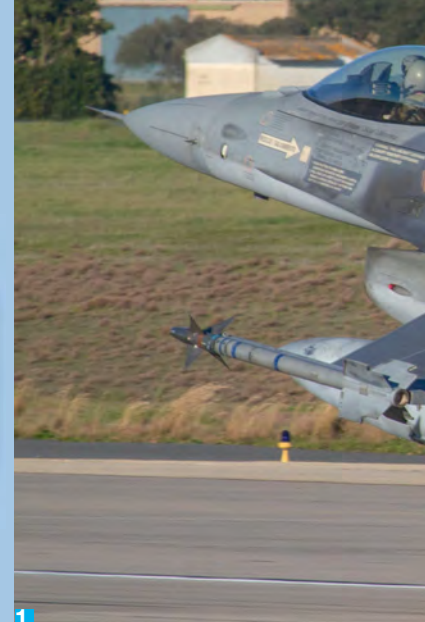
An annual military training exercise, Real Thaw is planned, organised and executed by the Força Aérea Portuguesa (FAP, Portuguese Air Force) to prepare its operational units for missions within the framework of international co-operation at both NATO and European Union levels. Centred on Base Aérea (BA, Air Base) 11 in Beja, this year's

activities were mostly carried out in central Portugal between September 22 and October 4.

The main goal of Real Thaw 2019 (RT19) was to provide training for tactical forces in an operating environment that was as realistic as possible, reflecting the type of operations that today's Portuguese military might conduct. The missions were designed to take into account

the respective requirements of air, land and sea forces and their assets. A large-force employment exercise, RT19 was intended to focus on interoperability between different countries in a joint multinational environment. Elements came from Denmark (air controllers only), France (C-130 and C-160 transports), NATO (E-3A AWACS), the Netherlands (ground liaison officers), Spain (C212 Aviocar) and the United States (C-130J and air controllers).

Units were employed under a simulated UN-authorised mandate, deploying as a multinational stabilisation force. The initial focus of the manoeuvres was an opposed-entry scenario, with a coalition projecting force into a failing state and encountering opposition from both regular and insurgent forces. To meet this demanding requirement, participants



1



2



3



had to conduct several major operations simultaneously: humanitarian assistance, peace support and combat.

Participants

Flying assets – including Portuguese F-16s and P-3C CUP+ maritime patrol aircraft – were controlled by a pair of NATO E-3A aircraft. Tactical transports from the FAP (C-130H and C295) and the USAF (C-130J) worked together, testing their capabilities and improving interoperability in conjunction with the Ejército del Aire (Spanish Air Force) C212. Real Thaw 2019 also marked the first operational appearance of the FAP's new AW119 Koala MkII helicopters, belonging to locally based Esquadra 552 'Zangões' ('Bumblebees'), together with the Alouette IIIs that they are replacing and EH101 Merlins.

A FAP force protection unit and air traffic controllers participated on the ground, while other local units included a Portuguese Army special operations

team, paratroopers and the Portuguese Navy's Destacamento de Ações Especiais (DAE, Special Actions Detachment), plus other military personnel from maintenance, support, information and other branches.

Main missions

The realistic scenarios provided training for air defence, convoy protection in humanitarian missions,

close air support (CAS) to ground forces, and special operations, with the opportunity to practice composite air operations (COMAO). Other activities included extraction operations of military and civilian elements (with or without an air threat), paratrooping of cargo and paratroopers, combat search and rescue (CSAR) and aero-medical evacuation. Offensive missions encompassed conventional and

guided ordnance delivered with high accuracy to fixed and mobile targets, as well as conventional attacks on maritime forces.

Conclusions

The Comando Aéreo – Portuguese Air Force Air Command – has conducted the Real Thaw series annually since 2009. The favourable meteorological conditions make Portugal an ideal venue for NATO allies to develop and hone capabilities for current and future challenges.

For the wider Portuguese armed forces, Real Thaw is a fundamental exercise, since it allows the air force to operate jointly with the army, navy and other international elements to develop a better understanding of multi-service military operations. Preparations of this kind are vital for the success of any assignment that the Portuguese forces might be called upon to perform. **AFM**



1: Portuguese Air Force F-16AM 15131 (M17-15/61-621, FMS 83-1068) recovers to Beja after an air defence mission. The FAP 'Vipers' are pooled between Monte Real's Esquadra 201 and 301. **2:** Serial 16702 (c/n 042) is one of the seven transport-configured C295Ms flown by Esquadra 502 'Elefantes' alongside five maritime patrol variants. These are home-based at Montijo. **3:** C-130H 16805 (c/n 382-4778) from Esquadra 501 'Bisontes' at Montijo tucks up its gear just over the runway surface for a dramatic departure from Beja. The first C-130 arrived in Portugal in September 1977. **4:** Serial 29702 is one of Beja-based Esquadra 552's new AW119 Koala MkII helicopters. Despite the arrival of the first Koalas at Beja, the Alouette III remains in use. Nuno Freitas **5:** Spanish Air Force T.12B-65 '72-11' is now in the twilight of its career with the air arm. Ala 72 is the last Spanish unit operating the veteran Aviocar. All photos Jorge Ruivo unless stated



The USAF's B-2A stealth bomber is the ultimate symbol of American military might. The batwing jet attracts headlines wherever it goes, so when an example landed at Iceland's Keflavik Air Base last August it received extensive coverage from local and international media. After its refuelling stop in Iceland, the bomber headed to RAF Fairford, Gloucestershire, to continue its new Arctic mission.

A few days later, the B-2 ventured into new territory when it headed north towards the Arctic Circle, flying around the top of Norway's North Cape. Within hours of the B-2 returning to its forward operating location in the UK, the US Air Forces in Europe had posted images of the Arctic flight online. The Pentagon wanted Russia to know the B-2 had been in its 'backyard.' This was an unprecedented show of force within

airspace close to Russia's northern coast.

So what led the USAF to fly one of its B-2s into the Arctic? The story of how the Arctic is turning into a new theatre of great power rivalry has its roots in the climate change crisis which is leading to the retreat of the Arctic ice cap. Until recently, this sheet of ice routinely stretched down to the northern coast of Russia in both winter and summer months. Global warming now means the ice has occasionally disappeared from Russia's coast in summer, allowing shipping to transit from the North Atlantic to the Pacific without the use of icebreaking ships. Scientists are predicting that in 20 years' time, the route could be open every summer. The retreat of the ice cap also offers the potential to exploit the mineral wealth of the region.

The geo-strategic implications of climate change have not been lost on the Kremlin, which sees

this both as an opportunity and a threat. The potential to extract more oil and gas from under the Arctic Sea or from previously ice-bound islands is viewed as a major boost to the Russian economy. However, the Russian military is very concerned that several thousands of miles of coastline will in future have to be defended from the sea, land and air. Russian government officials are also keen to ensure that they can control the 200nm exclusive economic zone, or EEZ, that under international law gives Moscow oil, gas and fishing rights across nearly a third of the Arctic. Legal claims by Russia could extend this further, although the United States, Canada, Norway and Denmark (which represents Greenland) are disputing these moves in international courts.

Arctic Command

Securing its Arctic region is a top priority for the Kremlin. So, in March 2017, President

The view from a USAF B-52H as three Royal Norwegian Air Force F-16s, another B-52, and a KC-135R assigned to the 100th Air Refueling Wing from RAF Mildenhall, Suffolk, fly together during Bomber Task Force Europe 20-1 over the Barents Sea region of the Arctic Circle on November 6, 2019. The RAF's deputy commander for operations, AM Gerry Mayhew, said the mission was "about interoperability. We have to work together in peace so we can push the message out that we're ready to do anything, anywhere." USAF/Airman 1st Class Duncan C Bevan

'New Co

Across the frozen Arctic north, Russia and the West are squaring up in a new confrontation as they seek to control the region's natural resources and vital sea routes. **Tim Ripley** looks at how rival air forces are at the centre of events in this strategically important area.

Vladimir Putin demonstrated his interest by flying to Russia's most northerly military base on the Franz Josef Land archipelago aboard a Vozdushno-Kosmicheskoye Sily Rossiyskoy Federatsii (VKS, Russian Aerospace Forces) Il-76 transport. He took Russian television crews with him to see the newly reinforced base, complete with helicopter hangars, an airstrip and new barracks to allow troops to live there throughout the Arctic winter. Putin certainly knows how to make headlines, but his military top brass knows that projecting and sustaining military power in the Arctic is not an easy business, even with global warming. The region's extreme climate, particularly in winter, makes it almost impossible for humans to survive there without hardened buildings and specialist survival training. Ships have to avoid ice floes and outside equipment on their decks can be rendered inoperable once frozen. ▶



A B-2A assigned to the 509th Bomb Wing at Whiteman Air Force Base, Missouri, prepares to receive fuel from a 100th Air Refueling Wing KC-135R from RAF Mildenhall over the Norwegian Sea on September 5, 2019. The Pentagon described this as an extended-duration flight that proved the stealth bomber's ability to operate in the Arctic circle. USAF/Staff Sgt Jordan Castelan



Old War'

at the top of the world



Russia's bases look very luxurious compared with old-style Arctic outposts that featured in the movies *Ice Station Zebra* and *The Thing*.

One of the Russian Aerospace Forces' rarely seen Tu-22MRs is escorted by a fully armed MiG-31 close to the Norwegian coast. The Tu-22MR is a theatre-level reconnaissance aircraft equipped with side-looking radar, an electronic intelligence system, infrared scanner and photo cameras. Today, just one aircraft is thought to remain operational at Belaya air base. via Dmitriy Pichugin



Air power provides war-winning advantages to armed forces attempting to operate in the Arctic – moving troops and supplies, monitoring huge areas of sea, coast and airspace and delivering precision-guided weapons. Air supremacy over the Arctic can be a game-changer so the VKS and Morskaya Aviatsiya Voenno-morskogo Flota (MA VMF, Russian Naval Aviation) have moved to bolster their ability to project power over the region.

This kicked off in 2014 with the setting up of the Northern Fleet Joint Strategic Command based in Severomorsk. This saw the Russian Northern Fleet given responsibility for air, land and sea forces based on the Kola Peninsula, as well as a long stretch of the northern coast out towards Siberia. Crucially, the command is responsible for all of Russia's Arctic islands as well as sea and airspace over the North Pole. Russian air operations over the Arctic are controlled by the Joint Strategic Command's air component, the 45th Air and Air Defence Army, which was formed from the Northern Fleet's MA VMF headquarters. This placed all fixed-wing aircraft and helicopters under a single command and saw the VKS transfer its tactical aircraft and helicopters based on the Kola Peninsula to naval aviation command. Ground-based surface-to-air missile (SAM) batteries and radar stations remained part of

the VKS as a result of this reorganisation, but those based in the Arctic report to the 45th Army's underground command post at the Northern Fleet's Severomorsk headquarters complex. The Tu-22M3 heavy bombers based on the Kola remained under Dalnyaya Aviatsiya (DA, Long-Range Aviation) command.

Forward operating locations

To open the Arctic to Russian air power, the Kremlin has embarked on a programme to set up a network of forward operating locations across the region so aircraft can be 'surged' from home bases in time of crisis or during exercises. The Joint Command's dedicated air units are mostly home based around Murmansk and Severomorsk, including units of Su-33, MiG-29KR/KUBR and MiG-31BM fighters, Ka-27 and Ka-29 naval helicopters, Mi-8 combat helicopters, Il-38 maritime patrol aircraft and Forpost unmanned aerial vehicles (UAVs). Further to the south, inland from Arkhangelsk, is Kipelovo, home of the Northern Fleet's giant Tu-142MK/MR maritime patrol aircraft.

This basing footprint is a legacy of the Cold War, when the main role of Soviet Naval Aviation was to protect the communist state's strategic nuclear submarine forces based around the Kola Peninsula. But it is far from ideal when it comes to projecting

air power to secure Russia's coastline thousands of miles to the east.

In the Cold War, both the Soviet Long-Range Aviation and the US Strategic Air Command envisaged flying over the Arctic to attack their opponent's homelands with nuclear weapons. Nuclear Armageddon would have played out over the Arctic. The Soviet Air Force built a network of radar stations, SAM batteries and airfields along Russia's northern coastline. After the end of the Cold War in 1989, this network of bases fell into disuse, although some sites were reactivated to help Western companies prospect for oil and gas in the region.

Over the past decade the airfields at Tiksi, Pevek and Vorkuta have started to boast a permanent Russian military presence again, with runways, hangars and radars being modernised. During the summer months it's now routine for Russian military helicopters to have a permanent presence at these bases and for larger fixed-wing aircraft to spend weeks at a time there for exercises. Long-Range Aviation Tu-95MS, Tu-160 and Tu-22M3 bombers have also been detected on commercial satellite images visiting these air bases for exercises run under the control of the Joint Strategic Command. For these exercises, a handful of the big bombers arrive at the airfields supported by Il-76 transports and Il-78 air-to-



Left: An aerial view of the Russian Severny Klever (Northern Clover) base, strategically located on Koteln Island, between the Laptev Sea and the East Siberian Sea on the Arctic shipping route. The base is protected by air defence systems and permanently houses up to 250 military personnel responsible for maintaining air and sea surveillance and coastal defences including anti-ship missiles. Russian MoD

Right: A pair of Russian Navy Ka-27 helicopters support an exercise by naval infantry during an 'Arctic campaign' carried out by the Northern Fleet and involving warships home-based in Severomorsk. Territorially, Russia's armed forces are divided into five areas: four military districts, plus the Northern Fleet, which became a separate entity enjoying similar status in December 2014. Russian MoD

Right above: A P-8A assigned to Patrol Squadron 16 (VP-16) 'War Eagles' arrives in Keflavík, Iceland, for a period of anti-submarine warfare training in April 2017. LTJG Matthew Skoglund, a naval flight officer, explained: "Training out of Keflavík is an excellent opportunity to hone our ASW skills in a northern environment. These types of detachments support our desire to improve our expeditionary capability within the US Sixth Fleet [area of operations]." US Navy/LTJG Matthew Skoglund



Above: Toting a Kh-22 (AS-4 'Kitchen') cruise missile on its centreline station, Belaya-based Tu-22M3 '34 Red' stills wears the St Andrew's cross insignia of the Russian Navy - the 'Backfire' fleet now serves exclusively with the VKS. In October 2017, a Tu-22M3 from Belaya made the type's first ever landing at Anadyr airfield on Chukotka, 700km from Alaska, with stopovers at Ukrainka and Yelizovo. via Dmitriy Pichugin

Left: A USAF captain, callsign 'Herc', assigned to the 96th Bomb Squadron adjusts communications settings in a B-52H during Bomber Task Force Europe 20-1 over the Barents Sea region of the Arctic Circle last November. Four of the strategic bombers from the 2nd Bomb Wing at Barksdale Air Force Base, Louisiana, completed a month-long deployment at RAF Fairford, Gloucestershire. USAF/Airman 1st Class Duncan C Bevan

air refuelling tankers, and sometimes protected by a detachment of fighter jets. Occasionally, the bombers will carry out live firings of Kh-55/555 or Kh-101 long-range cruise missiles at firing ranges along the northern Russian coast to demonstrate their strategic capabilities.

The Kremlin is keen to stake a claim to the island chains along Russia's northern coast and a series of permanent outposts have been set up on these remote territories. These bases look very luxurious compared with old-style Arctic outposts that featured in the movies *Ice Station Zebra* and *The Thing*. They have to be self-sufficient for the long Arctic winter when aircraft and ships often cannot get through to them due to the extreme weather. The northernmost

Russian outpost on Franz Josef Land boasts its own Mi-8 helicopter, but its runway for fixed-wing aircraft is covered in ice for most of the year, requiring highly experienced pilots to attempt landing there even in good weather. Plans have been announced to re-open old Cold War airfields on Graham Bell Island and Sredny Ostrov, but progress has been slow and satellite imagery of these sites suggests they have not yet returned to operational status.

It's not thought that Russia has moved heavy air defence systems onto Franz Josef Land, but it has beefed up the defences on bases closer to its coastline. A regiment of new S-400 SAMs was deployed at Rogachevo on Novaya Zemlya last September, replacing older

S-300 systems. Russian media covered the deployment of the new missiles to the site, which looked windswept and bleak, even in the Arctic summer. Garrisoning Russia's northern frontier is not for the faint-hearted, but more VKS missile crews are destined to serve in this region, with the Kremlin proposing to establish an air defence division to control new SAM batteries to be positioned along the coast from Novaya Zemlya, eastwards towards the Pacific.

Further to the east an expanded Arctic base has also recently been opened on Kotelný Island and it features a novel 'garage' system to allow Pantsir-S1 air defence systems and Bastion-P anti-ship missiles to be protected from the weather and deployed in time of crisis.

The sheer expanse of territory that needs protection means it's not practical for the Joint Strategic Command to secure every island with a garrison, so during summer months the Northern Fleet now deploys an amphibious task group to patrol the region. Last summer, the task group spent two months at sea and carried out several landing exercises. This culminated in the 'Ropucha'-class landing ship *Aleksandr Ostrovskiy* putting ashore troops and vehicles of the 61st Independent ▶



Naval Infantry Brigade on Bolshevik Island in Severnaya Zemlya to defeat what was called "a simulated sabotage group". Two Ka-27PS naval helicopters on supporting warships landed troops and flew simulated close air support missions during the landing.

The Northern Fleet had been destined to receive two French-made Mistral-class helicopter carriers, but this order was cancelled by Paris in the aftermath of the 2014 Crimea crisis. This in turn led to the MA VMF cancelling an order for 50 Ka-52K Katran navalised attack helicopters, with folding rotor blades and reinforced undercarriages. These helicopters were subsequently pitched to Egypt, which bought the surplus Mistral warships. In 2019, the Russian defence ministry announced the revival of the helicopter carrier plans, but with the ships being built at a shipyard in Crimea. This raises the prospect of the Northern Fleet at last getting a major boost to its amphibious force and finally receiving shipborne attack helicopters to help it protect Russia's Arctic outposts.

To provide early warning of hostile naval incursions across the Arctic, the Northern Fleet's aviation command is looking to expand the use of its Forpost UAVs around the Arctic. These tactical drones have already practised cueing targets for Kalibr cruise missiles launched from Russian nuclear attack submarines during live firing drills. In 2019, it emerged that the Russian Navy is planning to install data links on its Forpost, Il-38 and Tu-142 aircraft so maritime patrol aircraft can view the imagery gathered by the UAVs.

Western response

Russia's Arctic ambitions have not gone unnoticed by NATO nations, but they currently have a limited military presence in the Arctic. The alliance's largest military base in the Arctic is the Thule ballistic missile warning site and air base in Greenland, which is run jointly by the USAF and Danish military. Canada and Denmark (through its responsibilities for Greenland's defence) have small military outposts elsewhere in the Arctic region. No US or Danish combat aircraft are permanently based at Thule.

The most northerly NATO base is a signals intelligence site on Ellesmere Island, the Canadian Forces Station Alert, which was set up in the Cold War to monitor Soviet polar flights. It has been scaled back since then, but has taken on a new importance over the past decade.

Resupply is only possible in the summer months, with the Arctic-trained pilots of the Royal Canadian Air Force's (RCAF's) 8 Wing and New York Air National Guard's 109th Airlift Wing each year making a series of

Above: During winter, crews from Russia's Voenno-Transportnaya Aviatsiya (VTA, Military Transport Aviation) practice operations in heavy snow that will help prepare for potential deployments to the Arctic. This An-124-100 - RF-82011, named after the aircraft's designer, Oleg Antonov - was taking off from a semi-prepared airstrip running parallel to the main runway at Migalovo in the Tver region in February 2018. Also involved were An-22s, Il-76MDs and An-26s. **Below:** While a Royal Canadian Air Force CC-117 Globemaster III taxis in the foreground, a C-130 from the New York Air National Guard's 109th Airlift Wing takes off from Canadian Forces Station Alert on Ellesmere Island, Nunavut, after dropping off supplies last September 30. The ANG crew was assisting members of the RCAF's 8 Wing in transporting supplies from Thule Air Base, Greenland, to CFS Alert. Leading Seaman Paul Green/8 Wing Imaging



shuttle flights to stock up the base before the Arctic winter sets in. The ski-equipped LC-130s of the 109th Wing are among the few aircraft that can safely land on the station's ice runway - see also p68-73 in this issue.

The Canadian military had proposed building a new jet-capable airfield at its Nanisivik Naval Facility on north Baffin Island, but in 2012 these plans were abandoned on costs grounds.

Norway has no permanent military presence on the Svalbard (prior to 1925 known Spitsbergen) island chain due to a demilitarisation agreement with Russia, which has a large mining operation on the islands.

There has been a revamping of NATO air presence at Keflavik Air Base as a result of the Iceland Air Policing initiative, which began in 2008 to replace the presence of US fighters that had withdrawn two years earlier after the deactivation of the US-led Iceland Defence Force. This involves fighter units from across the alliance taking turns to deploy to Iceland for several weeks at a time. As tensions between NATO and Russia intensified in 2014 after the Crimea crisis, NATO fighters operating from Keflavik began standing up quick reaction alert (QRA) duty, ready to scramble to intercept hostile aircraft or assist civilian airliners in trouble. However, unlike in the Baltic States, the NATO mission in Iceland is not run on a year-round basis and fighters aren't present during winter months.

The US Navy has also moved to re-establish its presence at Keflavik with P-3C and P-8A maritime patrol aircraft returning to the base for occasional deployments. In April 2016, the Pentagon announced plans to build new hangars and support infrastructure for P-8A operations at Keflavik.

As described at the beginning of this article,

the USAF has also begun flying what are sometimes called 'aerial presence' flights into the Arctic region. The 2019 B-2 flight around the top of Norway followed a similar flight in September 2018 when a B-52H from RAF Fairford flew up around the top of Svalbard and Franz Josef Land, before heading south to skirt the coast of Novaya Zemlya.

The USAF electronic and signals intelligence community has also taken a great interest in the Russian military build-up in the Arctic region, regularly flying RC-135 Rivet Joint missions into the Barents Sea area from RAF Mildenhall in Suffolk. According to open-source monitoring of transponder signals, Rivet Joints have been joined on a number of these missions by RAF Sentinel R1 aircraft, flying from their home base at RAF Waddington, Lincolnshire.

Neither the RAF nor USAF routinely comment about these intelligence-gathering flights into the Arctic, but it seems obvious that they are returning to the Cold War tradition of 'ferret flights'. As the name suggests, the idea is to fly an aircraft within range of potentially hostile radar and air defences, in the hope that its presence will prompt a reaction that allows radar emissions and radio communications to be monitored.

Future war zone?

The Arctic is clearly rising up the agenda of military planners in Moscow, and NATO capitals are taking notice of events 'on the top of the world'. Even if military conflict is avoided, all the governments with a stake in the region want to make sure they can project power into the wider area to protect their economic interests from rival claims. Military forces are being positioned in the region to give political leaders options should the current 'New Cold War' turn 'hot'. **AFM**





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Accident Reports



British Army Watchkeeper WK006 after its mishap at Boscombe Down on November 2, 2015. Crown Copyright

D: Jan 13, 2008
N/U: British Army/47 Regiment RA/25/170 'Imjin' Battery
T: Hermes 450

While landing in poor visibility at Basra International Airport, Iraq, at 0958hrs local time, this UAV sustained major damage when it crashed into the airport terminal building. The runway was closed after the accident but reopened again at 1129hrs. Damage to the building was described as "superficial". This and most of the following new reports on UK UAV losses have been revealed as a result of a Freedom of Information request to the UK Ministry of Defence by Drone Wars UK.

D: Jun 2, 2009
N: British Army
T: Hermes 450
S: ZK513

As a result of a technical fault, this UAV crashed and was destroyed during a mission over Afghanistan.

D: May 2, 2010
N: Royal Air Force
T: MQ-9A Reaper
S: ZZ202

This UAV crashed during operations in Afghanistan as a result of human factors. It was later repaired and returned to service.

D: May 21, 2010
N: British Army
T: Hermes 450
S: ZK516

During operations in Afghanistan, this UAV was destroyed when it crashed as a result of human factors.

D: Jun 3, 2010
N: British Army
T: Hermes 450
S: ZK512

The cause of this crash in

Afghanistan has not been determined. The UAV was destroyed.

D: Mar 31, 2012
N: Royal Air Force
T: MQ-9A Reaper
S: ZZ203

This UAV was damaged as a result of human factors during landing while operating in Afghanistan. It was later repaired and returned to service.

D: Jul 22, 2012
N: British Army
T: Hermes 450
S: ZK506

This UAV was destroyed when it crashed in Afghanistan due to an undetermined technical fault.

D: Sep 5, 2013
N: British Army
T: Hermes 450
S: ZK518

As a result of required maintenance servicing not having been performed, this UAV was involved in an unspecified accident in Afghanistan. It was repaired, but then retired in 2014.

D: Oct 4, 2013



Above: Royal Norwegian Air Force AW101 Srs 612 0268, wearing only its original test registration ZZ103, visiting RAF Valley last November 19. The helicopter was recently rebuilt after an accident on November 24, 2017 and was on a test flight from Yeovil. MOD Crown Copyright/RAF Valley SAC Britney Leather

D: Apr 27, 2015
N: British Army
T: Watchkeeper
S: WK001

This UAV was damaged by a loose article at Roberts Barracks, Larkhill, Wiltshire. Further details are unknown.

D: Oct 17, 2015
N: Royal Air Force
T: MQ-9A Reaper
S: ZZ201

This UAV had an undercarriage collapse on landing at an undisclosed location. The Ministry of Defence said it had been withdrawn from service and subsequently shipped to the US for decommissioning, as it was nearing the end of its viable service life.

D: Nov 2, 2015
N: British Army
T: Watchkeeper
S: WK006

Updating the previous report on this accident (see *Attrition*, December 2015), the UK Ministry of Defence has confirmed the serial of the UAV involved. Following two aborted landing efforts, on the third attempt to touch down on runway 17 west at MOD Boscombe Down, Wiltshire, the Watchkeeper pitched nose down at 23ft (7m) above ground level, resulting in impact with the ground at approximately 35° nose-down, on the runway centreline, just over 328ft (100m) short of the planned touchdown point. The nose and main undercarriage collapsed, and the UAV slid along the runway for around 393ft (120m), coming to rest just off the western side of the runway with the nose section partly broken away. The Service Investigation found that the Vehicle Management System Computer (VMSC) had erroneously sensed the UAV was on the ground while it was still airborne, resulting in the VMSC commanding post-landing V-tail deflection and causing the crash.

D: Aug 16, 2016
N: Royal Air Force
T: MQ-9A Reaper
S: ZZ205

This previously reported accident (see *Attrition*, August 2018, p91) occurred at an unspecified base in the Middle East, and the UAV was damaged when it ran off the runway. The airframe was returned to a General

Atomics facility in California for rebuild, but as of October 2019 had still not been repaired.

D: Nov 24, 2017
N/U: Royal Norwegian Air Force/330 Skvadron
T: AW101 Srs 612
S: 0268

This helicopter has now been rebuilt, updating the original report on its accident (see *Attrition*, January 2018, p91). It was transported back to the manufacturer's facility in Yeovil, Somerset, where it arrived on July 24, 2018, to undergo repairs. These were completed by November 19, 2019, when it visited RAF Valley, Wales, during a test flight from Yeovil.

D: Jul 3, 2018
N/U: Royal Air Force/No 45 Squadron
T: 2 x Phenom T1
S: ZM335 and ZM336

The second of the Phenoms involved in this mid-air collision has also now been repaired. As previously reported, ZM335 was soon back in service (see *Attrition*, November 2018, p89), but ZM336 was more seriously damaged. After languishing at RAF Waddington, Lincolnshire for some time, on May 7, 2019, it made a ferry flight from Waddington to Stansted, where it was moved into the hangar of Inflight, the local authorised Embraer facility. Repairs had been completed by September 25, 2019, when it was flown back to Cranwell using callsign 'CWL30' and returned to service.

D: Feb 27, 2019
N/U: Indian Air Force/158 HU
T: Mi-17V-5
S: ZP5229

Updating our original report on this loss (see *Attrition*, April, p93), it was confirmed at a press conference on October 4 that the helicopter had been accidentally shot down by an Indian Air Force Rafael Spyder-SR short-range mobile air defence system, which had mistaken it for a hostile aircraft. The announcement, following a six-month court of inquiry investigation, confirmed rumours that had been circulating for some time that 'friendly fire' had been the cause. A contributory factor was that the helicopter's identification



Above: The wreckage of Republic of Korea National Fire Agency/National 119 Rescue Headquarters EC225LP Super Puma HL9619 being recovered on November 3. Korea Coast Guard

friend or foe (IFF) system had been switched off, contrary to standard operating procedures. The loss was also partly attributed to a lack of co-ordination between air traffic control and senior IAF officers. Although serial ZP5229 was flying from Srinagar Air Force Station (AFS), where 154 Helicopter Unit (HU) 'Snow Leopards' operates the Mi-17V-5, it's reported that it was being flown by 158 HU, based at Phalodi AFS.

D: May 29
N/U: Ukrainian Army
T: Aviation/16th Independent Army Aviation Brigade
T: Mi-8MTV
S: 638 (c/n 9 5238)

Updating our original report (see *Attrition*, July, p109), the serial number and precise variant of the Mi-8 which crashed are now known.

D: Oct 21
N/U: Airborne Tactical Advantage Company (ATAC)
T: Hawker Hunter Mk58
S: N344AX (ex-Swiss Air Force J-4062)

Italian Navy SH-101A MM81587 '2-08' on the flight deck of the destroyer 'Caio Duilio' on November 6. Italian Navy



While landing at Newport News/Williamsburg International Airport, Virginia, at 1338hrs local time the aircraft veered off the runway after the main undercarriage collapsed. The Hunter came to rest in grass alongside the runway but with the nose undercarriage still extended and resting on the edge of the runway. The pilot was uninjured and aircraft damage appeared to be minor.

D: Oct 29
N/U: US Air Force/314th Airlift Wing
T: C-130J-30 Super Hercules

While parked on the ramp at Little Rock Air Force Base, Arkansas, the nose undercarriage collapsed, causing some damage. No injuries were reported but the aircraft has been grounded while airframe damage is assessed.

D: Oct 31
N/U: Republic of Korea National Fire Agency/National 119 Rescue Headquarters
T: H225 (EC225LP)

Super Puma

S: HL9619
 Two to three minutes after take-off at 2326hrs local time from a helipad near a lighthouse on one of the disputed Dokdo islets, the helicopter was seen to be flying erratically at low level and then crashed into the Sea of Japan. All seven on board (two pilots, three fire department responders, the patient and a friend of the patient) were killed. The Super Puma had been on an air ambulance flight taking an injured fisherman to Daegu International Airport (IAP). Divers found the wreckage 1,970ft (600m) offshore at a depth of 236ft (72m), resting on the seabed. Recovery of the main body of the wreckage was completed on November 3, after which it was carried by a salvage vessel to Pohang, where it was unloaded the next day and transported to Gimpo IAP for further investigation.

D: Nov 1
N: US military
T: ScanEagle UAV

Houthi rebels claimed they had shot down this UAV while it was carrying out a reconnaissance mission over the port of Ras Isa, Yemen. Group spokesman Yehia Serie stated that the UAV, which he said was a ScanEagle, was downed "while carrying out hostile and spying activities in the border areas [with Saudi Arabia]". The Saudi-led coalition has made no comment on the claim, which has not been independently verified.

D: Nov 4
N/U: Bolivian Air Force/Grupo Aéreo 51/Escuadrón Aéreo 510
T: EC145 (BK117C-2)
S: FAB-007

Just after taking off at 1248hrs local time from Colquiri for a proposed flight to Oruro with the then president Evo Morales on board, this helicopter experienced a tail rotor problem and spun around several times before the pilot made a hard emergency landing. The crew and president were unharmed. The tail rotor was badly damaged, with the outer section of at least one blade torn away, but there did not appear to be any other serious damage.

D: Nov 6
N/U: Italian Navy/1° Gruppo Elicotteri

T: SH-101A (EH101-
110ASW/ASuW)
S: MM81587 '2-08'

This helicopter crashed on the flight deck of the Italian Navy Horizon-class anti-air warfare destroyer *Caio Duilio* (D 554) at around 1800hrs local time when it made a heavy landing during a routine night training flight. The SH-101A rolled onto its starboard side, resulting in extensive damage to the airframe, but all six crew were able to exit safely without injuries.

D: Nov 6
N: Turkish military
T: Unidentified UAV

Libyan Government of National Accord (GNA) sources claimed that the GNA had jammed this UAV and brought it down near Jufra, Libya. A conflicting report from pro-Libyan National Army sources showed the UAV, an unidentified, medium-sized, twin-tailboom type with a pusher propeller, roughly loaded on the back of a pickup truck and reported as being transported out of Misrata air base to avoid air strikes.

D: Nov 8
N: Unknown
T: Unidentified UAV

This unidentified UAV was shot down in Iranian airspace with an indigenously developed Mersad air defence system of the Iranian Army Air Defence Force while it flew over the southern Iranian port city of Bandar-e Mahshahr. The origin and intentions of the UAV were not known, but it was flying at low level. Initial reports that it was a US Navy drone were later discounted, with the US stating it had not lost any UAVs in the region at that time. Although the wreckage was recovered, Iran was unable to determine its origin.

D: Nov 9
N: UAE Air Force
and Air Defence?
T: S-100 Camcopter

Houthi rebels in Yemen announced they had shot down a reconnaissance UAV operated by the Saudi-led coalition during the morning in the As Sawh area of Yemen, just over the border from the Saudi Arabian town of Najran. It was the fourth UAV reported downed in the region within a ten-day period.

D: Nov 14
N/U: Japan Ground Self-Defense
Force/14th Brigade/15th
Rapid Deployment Regiment



Above: Russian Ministry of Defence Orion-E UAV '05 Yellow' after coming down near Protasovo air base on November 16.

T: FLIR Systems/Aeryon
SkyRanger R60

This small tactical reconnaissance UAV had been programmed to fly a night training mission in the Hijudai Exercise Area, Ooita prefecture, when it was reported missing around midnight. It was found stuck in a tree in a forest at 1130hrs on November 15, on a mountainside around 985ft (300m) north of the exercise area.

D: Nov 14
N: Nigerian Air Force
T: AW109LUH
S: NAF570

This helicopter crashed while attempting to land in Enugu state after a routine flight. There were no injuries to any of those on board but the AW109 rolled over and came to rest on its starboard side, resulting in extensive damage, including a severed tail section. A small fire was quickly extinguished by local firefighters.

D: Nov 14
N: Peruvian Air Force
T: Mi-8

Côte d'Ivoire Air Force Mi-24D TU-VHR
after its crash at Katiola Airport on
November 27.



D: Nov 16
N: Russian Ministry
of Defence
T: Orion-E UAV
S: '05 Yellow'

This medium-altitude long-endurance UAV prototype was undertaking a test flight from Protasovo air base, near Ryazan, when it crashed close to the airfield, coming down near apartment blocks in the village of Listvyanka. It was one of several prototypes being tested for the defence ministry and was extensively damaged, with both wings bent forward and almost severed from the fuselage at the wing root, the nose smashed and the tail section completely severed.

D: Nov 17
N: Syrian Air Force
T: Mi-8/17

This helicopter was destroyed when it exploded, along with its load of barrel bombs, at Hama air base. All three crew members were killed and the helicopter was destroyed. It is reported that while the barrel bombs were being loaded, a technical error led to one of them exploding prematurely; there was also substantial damage to buildings close to the air base.

D: Nov 20
N/U: Italian Air Force/
32° Stormo/28° Gruppo
T: MQ-9A Predator B (Reaper)

This UAV was destroyed when it crashed near Tarhuna, 40 miles (65km) southeast of Tripoli, Libya, at around 1200hrs local time. Libyan National Army forces said they had shot it down. The Italian Armed Forces General

Staff confirmed the loss, saying it was operating in support of Operazione Mare Sicuro (Operation Safe Sea) providing maritime surveillance off the coast of Libya.

D: Nov 20
N/U: US Army/1-227th AVN
T: AH-64D Apache

This helicopter crashed at Pangram village, Charkh district, Logar province, Afghanistan, killing both crew members, while on a mission to provide security for troops on the ground. Operation Resolute Support officials said preliminary reports do not indicate it was caused by enemy fire. It reportedly crashed after the rotors clipped the top of a mountain ridge.

D: Nov 21
N/U: Paraguayan Air Force/
 I Brigada Aérea/Grupo
 Aéreo de Helicópteros
T: UH-1H Iroquois
S: H-0440

While undertaking a counter-narcotics mission, this helicopter was preparing to land in the city of Pedro Juan Caballero, Amambay department, at around 1615hrs local time when it crashed and caught fire. There were no fatalities, but some of the four crew members and six Secretaría Nacional Antidrogas (SENAD, National Counter-Drug Secretariat) Fuerza de Tarea Conjunta (FTC, Joint Task Force) personnel were injured, although none seriously.

D: Nov 21
N/U: US Air Force/71st Flying
 Training Wing/25th
 Flying Training Squadron
T: 2 x T-38C Talon

These two aircraft collided at approximately 0910hrs local time during a paired landing as part of a routine formation training mission at Vance Air Force Base, Oklahoma. One ran off the runway and overturned before continuing for several hundred feet across the grass and coming to rest still inverted, with its undercarriage extended. Neither crew member was able to eject and both were killed. The second aircraft also ran off the runway and onto the grass, but remained upright and on its undercarriage, enabling both pilots to exit uninjured.

D: Nov 21
N: US Africa Command
T: Unspecified UAV



Above: The damaged cockpit of Côte d'Ivoire Air Force Mi-17 TU-VHM after it was struck by Mi-24D TU-VHR as it came in for landing at Katiola Airport.

US Africa Command confirmed that a UAV was lost on this date over Tripoli, Libya. Although US UAV operations in Libya are co-ordinated with Libyan government officials, a senior Libyan National Army official said it had been fired on after being mistaken for one of the Turkish-built UAVs used by opposition forces.

D: Nov 25
N/U: French Army Aviation
 Corps/5^e Régiment
 d'Helicoptères de Combat
T: AS532UL Cougar and
 Tigre HAP

These two helicopters collided and crashed at low altitude in total darkness at around 1940hrs French time, 12 miles (20km) south of In-Delimane, near Liptako, Mali, while participating in an Opération Barkhane mission supporting commandos on the ground who were fighting armed terrorist groups. All 13 personnel on the two helicopters were killed.

D: Nov 26
N: Israeli Air Force
T: S-65C-3 Yas'ur 2025
S: 042



Salvadoran Air Force Hughes 500E Guardiancillo 46/UNO-85P suffered an accident near Gao, Mali, while undertaking MINUSMA operations. FAS

sustained considerable damage while it was parked at Katiola Airport when the main rotors of landing Mi-24D TU-VHR sliced into it. The blades cut through the roof area, smashing some of the cockpit glazing and its supporting structure, while tearing out a large amount of electrical wiring from the upper area of the cockpit as well.

D: Nov 29
N/U: Salvadoran Air Force/
 MINUSMA Detachment/
 Contingente de
 Helicópteros de Ataque I
T: Hughes 500E Guardiancillo
S: 46/UNO-85P

While returning from a mission in support of the United Nations Multidimensional Integrated Stabilization Mission in Mali (MINUSMA), this helicopter had an in-flight emergency, force-landed and rolled over, breaking off the tail boom and main rotors, near Gao, Mali, at around 1630hrs local time. One crew member suffered a minor injury but the other escaped unhurt. The MD500E was deployed as part of the Torogoz V contingent, the fifth consecutive yearly deployment in support of MINUSMA.

D: Nov 29
N/U: Royal Saudi Land Forces
 Air Command/2nd Aviation
 Group/2nd Aviation
 Battalion
T: AH-64D Apache

Yemeni Houthi rebels shot down this helicopter with a surface-to-air missile in Asir province, Yemen, close to the border with Saudi Arabia. Both crew members, Abdul-Majid al-Omari and Saud al-Shahri, were killed.

D: Dec 1
N: Royal Saudi Air Force
T: CH-4 Rainbow
S: 20207

This armed UAV crashed and broke up in the Hiran district of the Hajjah governorate in Yemen, reportedly as a result of engine failure. Houthi rebels who found the wreckage claimed to have shot it down. Video of the downed UAV showed that it carried two AKD-10/Blue Arrow missiles under its wings.

Additional material from:
 Igor Bozinovski, Drone Wars UK, Scramble/Dutch Aviation Society, René L Uijthoven and Asagoro Yohko. **AFM**

Wings over

In French Polynesia, half a dozen military aircraft share a wide range of missions on a territory the size of Europe. As **Frédéric Lert** explains, there's a permanent battle against the 'tyranny of distance'.



Tahiti... While the name is suggestive of an island paradise, the reality of patrolling French Polynesia is a major challenge. It has a population of a medium-size city – 280,000 inhabitants – spread over five archipelagos and 118 islands, 76 of which are inhabited. All this in a maritime area that, if it was transposed onto a map of Europe, would stretch almost from London to Helsinki, and east to Athens.

This confetti of islands scattered across the map presents a big headache when it comes, for example, to recovering a premature baby from an isolated island, a fisherman adrift in a boat, or assisting the population after the passage of a cyclone. These missions and many more are entrusted to the Forces Armées en Polynésie Française (FAPF, Armed Forces in French Polynesia) which include fewer than a thousand military personnel. This relatively small force is specially adapted to the demands of the territory and includes a structure that's unique in the armed forces – the Groupement Aéronautique Militaire (GAM, Military Aeronautical Group) based at the international airport at Papeete-Faa'a, Tahiti.

The GAM brings together the Armée de l'Air's

(French Air Force's) Escadron de Transport (ET) 82 'Maine' and, for the Marine Nationale (French Navy), Flottille 25F, a detachment of Flottille 35F, and another detachment of Escadrille 22S (when it's not embarked on the surveillance frigate *Prairial*). Since 2012 the GAM has been under the command of a naval officer, today Capitaine de frégate (Commander) Jérémie Pihet, a former Lynx pilot.

Another peculiarity of Tahiti concerns the maintenance of the two 25F Falcon 200 Gardian aircraft and ET 82's two CN235s ('Casas'), which is handled by Sabena Technics – the company also manages the stocks of spare parts at Tahiti's airport. The Dauphins are maintained by the 35F detachment, with Airbus Helicopters supporting major overhauls. Commander Pihet summarised: "The GAM aircraft are well sized for the missions entrusted to us, and both helicopters and fixed-wing aircraft complement each other well. We could always dream of additional aircraft, but we must not lose sight of the fact that a larger



fleet would lead to an increase in infrastructure. For now, we have enough machines to fulfil our contract, especially as availability is good." In 2018 the GAM completed just over 2,600 flying hours, including 925 for 25F, 975 for ET 82 and 710 for 35F's two Dauphins.

Unique Dauphins

The Dauphin is another 'speciality' of Tahiti: the two aircraft based in Polynesia are the only AS365N3+ standard aircraft in French Navy service. The N3+ is powered by two Safran Helicopter Engines Arriel 2C turbines, has a maximum take-off weight of 4.3 tonnes, a speed of 140kts and the ability to carry eight people (the same capacity as the lifeboat carried on board). The helicopter has a winch and a 1600W SX-16 searchlight, although the latter is rarely used, most night work being conducted with night-vision goggles (NVGs). NVGs are not only very effective in finding a person in the water, but also for flying in mountainous terrain at night.

Another peculiarity of the Dauphins is that they ▶

r paradise



EEZ surveillance – a major challenge

An exclusive economic zone (EEZ), which extends 200nm from the coasts, is the maritime area over which a state has a monopoly on the exploration and use of resources. An EEZ is a capital asset that must be policed, in particular against illegal fishing. The Polynesian EEZ is protected from foreign fishermen using the combined surveillance tools (satellites, naval vessels and aircraft) deployed by France. All civilian vessels of a certain tonnage are required to use an automatic identification system (AIS),

which must be permanently activated to enable their location and identification. Fishing vessels are also obliged to implement a vessel monitoring system (VMS) which provides real-time satellite information on their position and speed. A busy fishing boat will be advancing at a pace easily identifiable using the VMS. And if that vessel is to switch off its transmitter for a significant period, it would also become a point of interest that would be immediately checked by a Falcon 200 Gardian or a ship.



Main image: The CN235's range allows it to reach New Zealand or Hawaii with intermediate stops. The aircraft, which almost always fly over open water, are carefully maintained in order to avoid any corrosion problems. Serial 072 '62-IF' is one of 19 CN235M-200 aircraft remaining in air force service. Photograph-FAPF Above; Serial 6872 is one of two Tahiti-based Dauphin N3+ helicopters that are the jack of all trades within these French territories. To retrieve a patient requiring urgent medical attention they can fly as far as seven hours from Tahiti, with multiple refuellings. Above left: The somewhat cramped interior of a Dauphin during a rescue mission. These helicopters – the only examples of the AS365N3+ in service within the French Navy – should be replaced by the larger H160M sometime in the next decade. Left: The traditional 'vahine' – a Polynesian woman – is still displayed on most if not all the military patches worn in Polynesia. All photos Frédéric Lert unless stated



The Falcon 200 Guardian is equipped with a hatch that facilitates airdrops of life rafts. Two rafts of different sizes are permanently stored on board, except when the aircraft is engaged in medical transport missions, during which a stretcher takes their allocated space.

were acquired in an 'inter-ministerial' fashion, and the ministries of defence, the interior and overseas territories also share the operating costs. Tahiti's 35F detachment operates with only 22 people: three six-person crews and a technical reinforcement of four people. All year long, a team mans the first-response helicopter (1hr readiness during the day, 2hrs at night), another team is on second alert (6hrs day and night), and the third team is either training or on leave. Capitaine de corvette (Lt Cdr) Jean-François T, one of the detachment's three captains, explained: "Most of our work is assistance to the population. In 2018 we completed 116 missions and rescued 80 people. By the end of September 2019, we had already rescued 78 people. Our pace is very intense." Fifteen flying hours for a helicopter tasked with a single medical evacuation (medevac) is a scenario unknown in Europe but is relatively common in Polynesia.

Hopping from island to island, a Dauphin can reach all the Polynesian archipelagos. For distant missions requiring refuelling at airports without any fuel depots, it can work in partnership with a 'Casa' that will accompany it throughout and 'defuel' to the helicopter when required. Although Polynesia is primarily a maritime assignment, most helicopter missions are flown above terra firma. The proportion of maritime rescue – around 35% of the missions in 2018 – is actually much lower than in metropolitan France.

Secondary missions focus on the fight against drugs (supporting the Gendarmerie in its search and destruction of pakalolo fields, the local cannabis), training with the local arm of the Groupe d'Intervention de la Gendarmerie Nationale (GIGN, Gendarmerie special intervention group) and taking advantage of the presence of Tahiti-based frigate *Prairial* to maintain deck-landing qualifications. In 2017,

35F also assumed the firefighting mission and crews received theoretical instruction from the Sécurité Civile in the use of the Bambi Bucket. This knowhow was put to good use against a major forest fire in western Tahiti last August 24-26. The two Dauphins flew 166 rotations in 36 hours, dropping 116 tonnes of water.

Tropical Gardian

Flottille 25F flies the Falcon 200 Gardian and is active between Tahiti and Nouméa (French New Caledonia). Each base employs two Falcon 200 Gardians (derived from the HU-25 Guardian developed for the US Coast Guard in the late 1970s) while a fifth aircraft is usually in the hands of Sabena Technics for programmed maintenance. Flottille 25F is another small unit, with 25 personnel, including three crews and seven ground technicians. The crews assigned to 25F are typically well-honed, with around ten years of experience in the maritime patrol business, and their training is conducted on the Gardian, in Tahiti. Each aircraft is manned by a six-person crew: two pilots, two navigators, a radio operator/observer and a flight mechanic.

The Gardian is equipped with the same radar as the Atlantique 2, but it's placed in the aircraft nose and not under the belly, so it's not panoramic – a 120° blind spot remains to the rear of the aircraft. Like its bigger brother the Falcon 50M, the Gardian is also equipped with a hatch allowing a variety of stores to be airdropped: inflatable life rafts (two are carried, for ten and 25 people), smoke flares, buoys and even ballot papers ahead of an election.

Much like the Dauphins, the two Falcon 200 Gardians are used for a wide range of missions, the first of which is the 4hr search and rescue (SAR) alert. Capitaine de corvette Sébastien Le Darz, commander of the squadron, told AFM: "ICAO [the International



Below: The CN235s are invaluable when it comes to delivering goods and people to the remotest islands in French Polynesia. ET 82's crew are also able to use these far-flung runways at night, using only the most basic lighting. Photographie-FAPF



A rare sight in the Flottille 25F hangar at Papeete-Faa'a International Airport, with three of the squadron's five Falcon 200 Gardians. One of these aircraft was preparing to leave and re-join the 25F detachment in New Caledonia.

Civil Aviation Organization] requires a sea rescue capability associated with the operation of Papeete-Faa'a International Airport." Another important mission is medevac, with the possibility of carrying a stretcher patient, installed in place of the inflatable life rafts and buoys. The crew is then limited to four, plus the staff and medical equipment. Photo missions are also regularly organised to update databases on atolls, including the evolution of anchorages for the ships. Finally, the Falcon can accommodate two VIP seats at the front of the cabin, making it possible to transport high-level authorities beyond the borders of Polynesia when commercial airlines can't offer the desired flexibility. Flying to Hawaii is completed in two legs of 3.5hrs each, with an intermediate stop in the Kiribati Islands in the central Pacific. It's similar when it comes to flying down to New Zealand or New Caledonia, this time with an intermediate refuelling point in the Tonga Islands.

'Maine' CN235s

The third essential component of the GAM, ET 82 'Maine' is present in Tahiti with two CN235-200 aircraft and 27 personnel, including six pilots and four flight engineers. The technical staff manages line maintenance and small repairs, but like the Gardians, heavy maintenance and spare parts are the responsibility of Sabena Technics.

In another similarity with 25F, ET 82 only receives seasoned pilots who have already gained experience on the Transall, Hercules or CN235 in France. Newcomers begin as a co-pilot in the right seat, but they can regain their plane captain qualification after 50hrs of flying. To prevent any risk of corrosion, the aircraft are rinsed, including the engines, after each flight and they benefit from a more thorough washing after every 25 hours of flight.

The Nouméa-based ET 52 'La Tontouta' also flies two CN235s and there are frequent exchanges of crews or aircraft between the two units. A 'Casa' and its crew always stand on alert during Polynesia's hurricane season. The transports are also used for medevac; the squadron flies an average of two such missions per month and this accounts for around 10% of

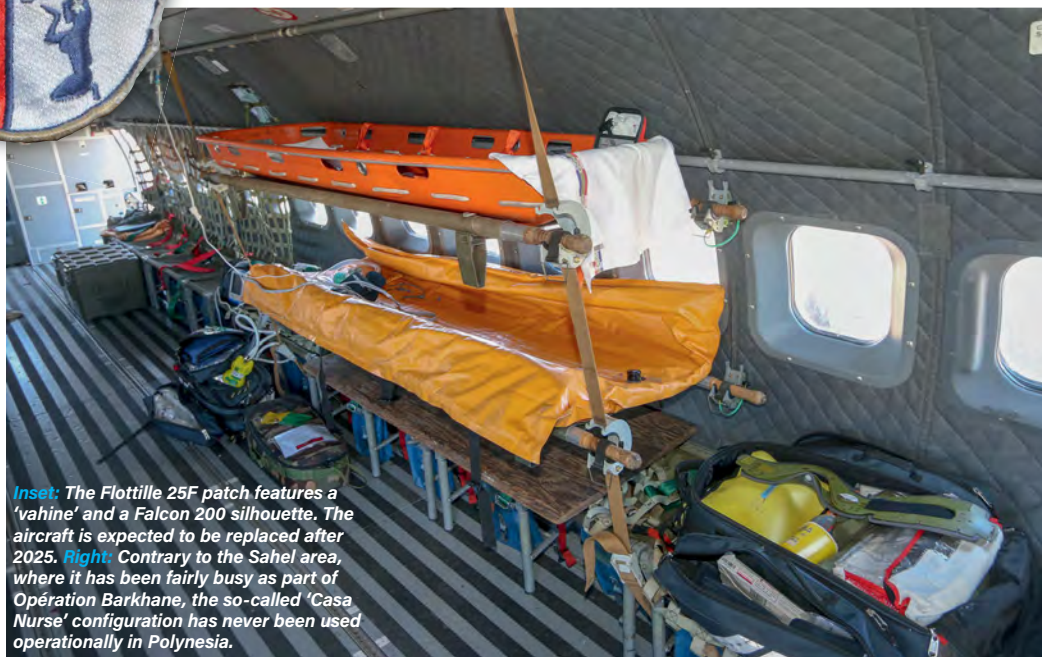
its activity. A feature of the CN235, shared with the Dauphin, is its ability to carry an incubator for the transport of premature babies. By day, medical transports are normally handled by commercial operator Air Archipels, using DHC-6 Twin Otter and Beechcraft 200 aircraft. At night, this becomes the prerogative of military aircraft, whose crews are the only ones able to land on short (3,280ft/1,000m) and dimly lit runways. When required, runway lighting is provided by local firemen or Gendarmes trained to install a basic kit of six lights (two 328ft/100m after the threshold, two 1,312ft/400m further on, and the last two 328ft before the runway's end).

The CN235's second mission, air-sea rescue, is conducted with SAR kits and buoys. Loads are parachuted manually from the rear side doors. The absence of an army team in Tahiti able to prepare large droppable pallets prevents delivery of heavy loads via the rear ramp. However, since last March, the squadron has acquired the capacity to autonomously assemble and release packages up to 331lb (150kg), once again from the rear side doors.

With a full complement of 9,200lb (4,173kg) of fuel, the 'Casa' has around 6hrs of

flying time. With 2.5 tonnes of fuel and around 20 passengers, plus luggage, its range is around 1,200nm. This is enough to reach any island in Polynesia but not normally sufficient to fly beyond the French territories. Reaching Nouméa requires 11hrs of flying and a stopover in the Kiribati Islands. The same applies for Hawaii or Japan, which are within reach of the CN235, but require a lot of patience! These long missions are significant for ET 82, since they allow the crews to experience a demanding aeronautical environment. The Gardian can also reach distant destinations with multiple stopovers. The small jet boasts a maximum endurance of about 5hrs, slightly reduced when flying west and facing the trade winds. Everything is a matter of precise navigation and fuel management.

Withdrawal of the Gardian from service is expected from 2025 and 25F will ultimately be re-equipped with the Falcon 2000 Albatross. The succession of the Dauphin N3+ will be ensured by the future H160M. Possible replacement of the CN235s with a number of C-130s has also been discussed. Flying the Hercules from Tahiti would clearly provide the Armée de l'Air with a significant increase in autonomy and transport capacity. **AFM**



Inset: The Flottille 25F patch features a 'vahine' and a Falcon 200 silhouette. The aircraft is expected to be replaced after 2025. **Right:** Contrary to the Sahel area, where it has been fairly busy as part of Opération Barkhane, the so-called 'Casa Nurse' configuration has never been used operationally in Polynesia.

Air battles over

Riccardo Niccoli reports from Ovda, where the latest Blue Flag exercise involved around 1,000 personnel and 70 aircraft – including, for the first time, F-35s from both Israel and Italy.

Although only established in 2013, the Israeli Air Force's (IAF's) biennial Blue Flag is recognised as one of the most important international events of its kind – for three crucial reasons: first, the IAF boasts impressive operational capabilities and exposes its units to realistic exercises as part of an aggressive training philosophy. Second, it's staged in an area perfect for air operations – the Negev desert is not only almost uninhabited, but it's possible to fly at all altitudes and speeds. It also includes well-equipped ranges. Finally, as the IAF's most advanced air exercise, Blue Flag features the air arm's best units – including 115 'Flying Dragon' Squadron, specialised in the Red Air mission – plus visitors from some of the

most advanced Western air forces.

The 2019 manoeuvres, held as usual at Ovda Air Base, included contingents from Germany, Greece, Italy and the United States. The United States Air Forces in Europe (USAFE) deployed its 480th Fighter Squadron (FS), from Spangdahlem AB, Germany, operating the F-16CM Block 50 in the 'Wild Weasel' role. The German Luftwaffe sent a detachment from Taktisches Luftwaffengeschwader 71 (TaktLwG 71) 'Richthofen', flying the Eurofighter. The Hellenic Air Force selected its 335 Mira from Araxos air base, operating Greece's most advanced Fighting Falcon version – the F-16C/D Block 52M (the local designation for the Block 52+ Advanced). However, the most numerous foreign contingent was from the Italian Air Force, which deployed six F-35As from the 32nd Stormo, six F-2000A Typhoons from a multi-wing team headed by the

4th Stormo, and one of 14th Stormo's E-550As – the Italian designation for the G550 Conformal Airborne Early Warning (CAEW) aircraft.

Tal Herman, chief of the Blue Flag management team, is a former IAF lieutenant colonel and today a reservist. He outlined the most significant aspect of the 2019 exercise: "This is the first time in which Israeli F-35s have taken part in an international exercise, and they are flying using the Link 16 data link system in conjunction with NATO aircraft." The fifth-generation aircraft also features the Multifunction Advanced Data Link (MADL) but it's not known if the Israeli and Italian jets used this in the exercise to exchange additional data more securely.

Another 'first' for this fourth iteration of Blue Flag was the deployment of Israeli F-35s at a base other than their home station of Nevatim. Interestingly, it



Riccardo Niccoli



er Ovda

had been necessary to cut away some of the concrete from around the entrances of Ovda's shelters to accommodate the F-35.

Israeli Red Air

The role of 115 Squadron, and of the local ground control intercept (GCI) squadron, was fundamental: these units form the IAF's Advanced Training Center (ATC), and provided the training activities and adjusted the level of difficulty according to the participants. They also selected the degree of aggressiveness for Red Air. Among the rules of engagement, it's notable that a 'kill' by an F-35 using beyond-visual-range (BVR) radar-guided missiles was not considered valid. Red Air and Blue Air assets 'killed' during missions could regenerate, re-entering the combat under specific rules. On the other hand, Blue aircraft assigned to offensive tasks had

to return to Ovda once 'killed'.

The scenarios were planned together with the IAF's 133 Squadron, flying the F-15 Baz, which was the lead unit.

Around Ovda are various ranges and training areas, dedicated to live weapons delivery, supersonic flight at high altitude, or very-low-level flight. These training areas have electronic warfare systems, surface-to-air missiles (SAMs), plus real and simulated targets. Some targets comprise inflatable 'shapes' that accurately simulate real-world systems.

The IAF's 115 Squadron plays a critical role in the exercise, not only because its pilots are instructors specialised in the aggressor mission, but also because these aviators adopt an 'active' philosophy during operations. They don't carry out their role passively, but develop their own plans to best



counter the Blue forces, reacting to their activity, and increasing the threat level, including the use of (simulated) BVR missile armament. Herman explained: "They simulated the most dangerous threats, including the Russian Su-57 fighter". Red Air included F-16C Baraks, plus AH-64 and UH-60 helicopters (drawn from other squadrons), as well as other Israeli fighters that rotated between Blue and Red, including F-35s. Aircraft from Germany, Greece, Italy and the US flew exclusively as Blue Air. The 'enemy' also included Patriot PAC-3 SAM batteries, locally known as Yahalom. In terms of the 'enemy', Lt Col Panagiotis Katsikaris, commander of 335 Mira, stated: "The Red Force provided a significant challenge. The Reds started out easy during the first few flights, but we noticed their tactics changing as the days went by. They operated differently each day,

and we had to act accordingly. We learned valuable lessons each day."

Other Israeli assets participating in the exercise included unmanned aerial vehicles and other helicopters of undisclosed types and units.

'Building blocks'

Blue Flag develops according to a 'building block' approach. The exercise, which took around a year to be planned, started on October 27, with the first day of familiarisation flights, in which foreign pilots became used to local airspace and procedures, an initial phase of theatre entry began on November 4. In this period, participants trained in small formations. From the following day, activities were dedicated to defensive counter-air (DCA) missions, with Blue Forces defending a territory, reflecting daily IAF training, although



Above right: Capt Aaron Zarmbinski, a 480th FS pilot, climbs out the cockpit of his F-16C after participating in a Blue Flag mission on November 5. As well as SEAD/DEAD, the airmen of the 480th fly swing-role missions, protecting offensive counter-air assets using their AIM-120 and AIM-9X missiles. USAF/Airman 1st Class Kyle Cope **Left:** Operated by the IAF's Ramon-based 201 'The One' Squadron, F-16I Sufa 808 launches from Ovda. The Sufa (Storm), which entered service in 2004, is stationed at Israel's southern air bases, Hatzerim and Ramon, and specialises in long-range strikes. Dr Andreas Zeitler **Right:** A high-speed flyby for Italian Air Force F-35A MM7358 (AL-8) '32-08' from the 13° Gruppo. The Aeronautica Militare Lightnings are home-based at Amendola in southeast Italy, where the 13° Gruppo comes under the command of the resident 32° Stormo. Riccardo Niccoli

Blue Flag 2019 participating aircraft

Nation	Aircraft	Quantity	Unit
Germany	EF2000	6	TaktLwG 71 'R'
Greece	F-16C/D Block 52M	6	335 Mira
Israel	F-15A/B/D	9	133 Squadron
	F-16I	9	201 Squadron
	F-35I	6	140 Squadron
	F-16C	7	115 Squadron*
	G550 CAEW	1	122 Squadron
	AH-64/UH-60	2-4	?
	UAVs	2-4	?
	Boeing 707	1	120 Squadron
Italy	F-2000A	6	4° Stormo
	F-35A	6	32° Stormo
	E-550A CAEW	1	14° Stormo
US	F-16CM/DM Block 50	12	480th FS*

* F-16Cs of 117 Squadron were operated by 115 Squadron; 117 did not participate in the exercise.



Adir debut

Blue Flag 2019 was important for the IAF as it was the first multinational exercise for its F-35I Adir. Lt Col 'T', commander of 140 'Golden Eagle' Squadron, told *AFM*: "This is our first time showing the Adir to international air forces. So far, our training and co-operation using the Adir was performed within the [IAF]. This is the first showing of the air force's new capabilities." Of course, when operating the F-35 together with other types of fighter, care had to be taken to maximise the learning value to reflect different roles and capabilities.

"This adjustment is complex," explained Col 'A'. "We made it so aircraft from different generations can train in parallel, with each of them having targets of their own." As for the ability of the F-35s to work with other nations, Lt Col 'T' confirmed: "Our ability to sit together, brief, debrief and exchange information allowed us to take a step forward in our work, and see how each side does things differently while optimising use of the aircraft's capabilities." According to the Israelis, "the two F-35 teams learned a lot from each other."



NATO air forces generally face a lower threat level guarding their national airspaces. Lt Col 'M' (his full name was withheld), commander of 133 Squadron, confirmed: "Airspace defence isn't common in NATO countries. We teach the international forces how to protect the country's skies, just as we do in our day-to-day operational activity in Israel."

A second phase started on November 10, with another period of theatre entry, now concerning offensive operations. In this phase, known as small-force employment (SFE), the activity was focused

on attacking ground targets and suppression/destruction of enemy air defence (SEAD/DEAD) operations. The final day, November 14, was dedicated to executing a large-force employment mission, for which the Blue Forces received only guidelines, and were then free to execute the mission in the way they chose.

Each Blue Flag flying day included two main missions, one in the morning and one in the afternoon, but both DCA and SFE phases also included a night mission. The package commanders were chosen on a rotational basis from

participating units. Personnel were kept busy. Those flying in the morning wave had to arrive on base at 0700hrs and, after all the planning, briefing and unit debriefing, they finished the working day with a mass debriefing at around 1700hrs. Those flying the afternoon mission were committed to activity well into the night. Added to that, foreign personnel were accommodated in Eilat, around an hour's drive from the base.

The focus of the exercise was on skills of the single pilot (or aircrew), cockpit management and small formations. With the exception of the last day, no large composite air operations (COMAOs) were flown. Even the command and control (C2) component, provided by Israeli and Italian CAEW aircraft, operated only as a local provider, to increase the demands on every single pilot/aircrew.

Blue Flag participants could operate in large areas of airspace across the Negev desert, south of Be'er Sheva and the Dead Sea. Throughout the exercise, flying by IAF units in this area was limited – including for the flying school. Civil air traffic also faced many restrictions, above all for flights to and from the new Ramon International Airport – this was closed for around five hours each day, during the two missions. Each mission was divided into two or three waves of around a dozen aircraft each to reduce congestion in airspaces over the ranges.

As in the past, the hosts sought to highlight the political importance of the exercise. Col 'M', commander of Ovda Air Base, explained: "The four countries' co-operation with Israel paves the way for many

wonderful future opportunities. The air base has an opportunity to open its doors and show these countries the air force and its strength." Importance was given also to social events, designed to strengthen the relationship between the various military contingents.

Italians in force

The Italian Air Force was the second most numerous participant, bringing 13 aircraft of three types to Ovda, plus around 200 military personnel. According to the commander of the Italian detachment (name withheld on security grounds): "The aim of this exercise was to train in a complex scenario, carrying out mainly COMAOs including low and very low-level flying activity. Several tactics and manoeuvres against SAM systems were tested, including the use of chaff and flare countermeasures. Blue Flag offers the opportunity to operate in a training environment that's complex and highly qualified, considering the number and variety of the air assets, and the technological capabilities deployed by the participants. These exercises allow the aircrews to sharpen their tactics, procedures and techniques, in order to rapidly act in crisis operations, within multinational and international co-operation missions. Our omni-role assets [the F-35] allowed us to carry out a wide range of activities, even changing the assigned tasks during the mission, demonstrating versatility, advanced and superior capability, and the 'task enabler' role of this weapon system. We trained in a very complex and realistic electronic warfare scenario,

Above: The pilot of Adir 913 (AS-9, FMS 15-5157) signals prior to departure. **The Israeli F-35s** – assigned to 140 Squadron – were participating in a multinational exercise for the first time. Riccardo Niccoli. **Below:** Although wearing the markings of 117 'First Jet' Squadron, F-16C Barak 318 was piloted by an aggressor from Ovda's resident 115 'Flying Dragon' Squadron. Other Red Air threats included AH-64 and UH-60 helicopters, Israeli F-35s and Patriot SAM batteries. Riccardo Niccoli



and our information superiority and sharing were critical in achieving the objectives of the missions."

The objectives assigned to the various Italian types were different: the F-35 worked on integration with fourth-generation assets, with the additional possibility to integrate with other fifth-generation aircraft. For the Typhoon it was an opportunity to work in co-operation with national and international C2 assets, in an operational environment full of electronic threats. Finally, the CAEW aircrews were tasked with improving their ability to control a large number of assets in support of operations against real threats provided by SAM systems.

Wild Weasels

The USAFE participants were also enthusiastic about the Blue Flag exercise. Capt Andrew Burns, a 480th FS F-16C pilot, explained: "Practising in Israel provides a great opportunity to fly at a low altitude and to fly against some live emitters, which is great training. It also allows us to see how different cultures think about solving problems, allowing us to come up with a better solution overall and build relationships with the other nations here that we can bring forward."

Capt Kaleb Jenkins, the 52nd Fighter Wing project officer for the exercise said: "Some of the tactical lessons learned were force structuring and how to best utilise the assets that we have available to us. Also, coming up with different game plans and how we are going to enable that in order to work through language barriers. We worked with people that we don't



Above: IAF F-15D Baz 715 wore the markings of 106 'Tip of the Spear' Squadron. The fighter was apparently bailed to 133 'Knights of the Twin Tail' Squadron during the exercise. The latter squadron was the lead unit for the exercise, and it also orchestrated the previous Blue Flag 2017. Riccardo Niccoli
Below: An IAF G550 Conformal Airborne Early Warning (CAEW) aircraft. Serial 569 is one of two Nachshon Eitam aircraft operated by 122 Squadron at Nevatim. These Gulfstream G550s are fitted with conformal phased-array radars on both sides of the forward fuselage. Mike Green



Above: One of the Luftwaffe's contingent of Eurofighters, 31+08 taxis over a road across the runway at Ovda. The jet carries the 'Richthofen' insignia of Taktisches Luftwaffengeschwader 71, based at Wittmund in northern Germany. Riccardo Niccoli
Below: F-2000A MM7294 '37-25' wearing the markings of the 18° Gruppo prepares to depart Ovda on November 11. The 18° Gruppo is one of five historic Gruppi Caccia (fighter squadrons) of the Italian Air Force that date back to World War One. It is part of the 37° Stormo at Trapani in Sicily, but was subordinated to the 4° Stormo for Blue Flag. Riccardo Niccoli



normally work with when we do our normal exercises throughout USAFE. It was a bit different having to solve those problems. The Link 16 data link between our aircraft allows our jets to talk to each other, so we have spatial orientation of where other people's jets are. Link 16 helps keep track of people a little easier and keep track of information on the battlespace – it allows us to cut the time in the language barrier and just see a digital display of different portions of the tactical airspace. It is about understanding each other's capabilities and vulnerabilities and how we come up with the best game plan to maximise our lethality, take advantage of all of our strengths, while protecting people's weaknesses."

Finally, Lt Gen Steven Basham, United States Air Forces in Europe – Air Forces Africa deputy commander, stated: "As we come here and train as five nations in a Blue Flag exercise, we not only increase the readiness of our aviators and United States Air Forces in Europe – Air Forces Africa, but we also increase the interoperability and integration with four other partner nations. There is no better opportunity to increase the readiness of our units inside USAFE-AFACRICA, and also those units that are trained and ready to go to war for European Command." **AFM**

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Other forthcoming features include:

- Exclusive coverage from the air war in the Central African Republic
- Force Report: Peruvian Air Force
- PLA's Hong Kong Garrison – troubled times in the Special Administrative Region
- 31° Stormo – Italian Air Force VIP transport specialists

Gando air base in the Canary Islands is an ideal location for the Ejército del Aire (Spanish Air Force) to put its air defence capabilities to the test. In the next *AFM*, we report from the first iteration of the Ocean Sky exercise, during which around 50 fighters from Spain, Turkey and the US met for dissimilar air combat training sorties over 12 intense days of flying in one of Europe's largest training areas. Here, air-to-air combat can be practised in all its forms, without speed or height restrictions, and with opportunities to launch chaff and flares.

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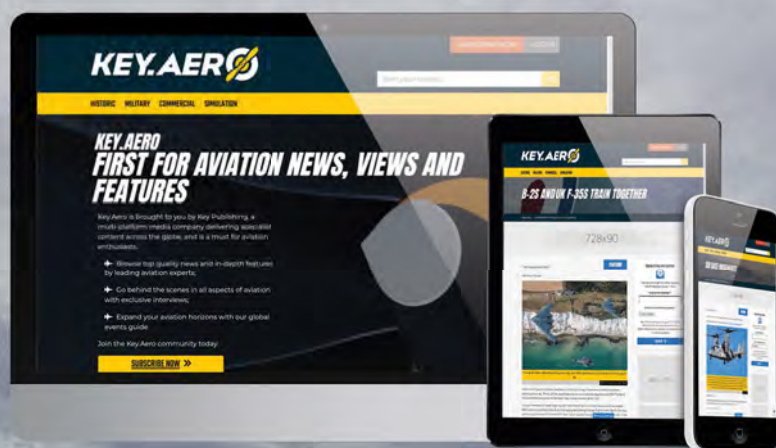
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